The Chemical Age

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Notes and Comments

The Profession of Chemistry

THERE is in the current issue of the "Chemical Practitioner," the organ of the British Association of Chemists, one sentence in particular that appears to us to cut at the root of much muddled thinking and to be worthy of examination not only in the light of its relative degree of truth, but also of its implications. It runs thus: "In this age it has become clear that politics do not exist apart from, and are indeed only a reflection of, economic necessity." The sentence particularly interests those who recollect as younger chemists the feelings akin to horror with which they observed the formation of the B.A.C., with all its suggestion of the application of trade union methods to the learned professions. Even the fact that medical men, by the public loosely and generally styled "Doctors," have adopted an equally trade union type of organisation, did not really reconcile them to the startling theory that professional men were subject to the same laws of industrial relationship with their employers as are the workmen. So far as economic considerations are concerned, the conclusion has been reached that the relation existing between the professional man and his employer *to-day* is exactly the same as that existing between employers and employed in every walk of life. Employers are even more likely to "exploit" the individualist black-coated worker than they are to gain a mean advantage over the workmen; the fact that most of them do not do so has no bearing on the argument, which is exactly similar to that existing in the theatrical profession and which seems on the point of a happy settlement.

The bulk of employers may be thoroughly honest in their dealing, but there exist the bogus managers, as well as the dishonest employers, and some organisation is the only sound way of dealing with both. The fact is, of course, that economic necessity has become greater during the past 20 years. Before the war the qualified chemist was sufficient of a rarity to be able to look after himself. When a good man went, it might not be possible to replace him. To-day there are few that cannot be replaced. We could mention the names of half a dozen men holding chemical posts for which they are paid over £1,000 a year, who could be replaced to-morrow without any great disturbance in the efficiency of their department. That is no reflection upon them; it arises solely from the higher standard of education, from the greater number of the scientifically educated, and from the wider experience of the chemists of to-day. It also arises from the greater mechanisation even of research. The individualistic research of yesterday is giving place to team work in which a group of men lays down the methods of attack and to each is apportioned a slice of the problem. The great chemists do not stand out to-day as they did yesteryear.

Permanent Consultants

THOSE who for one reason or another find themselves cast out of a post in which they were earning high salaries know by painful experience that employers look askance at them. The larger employer will be training his own men to fill the higher posts when their turn comes and will not care about bringing in outsiders at a high salary; the smaller employer will not give the now unemployed high-salary man a chance to work at a lower salary because of the fear that the new man will know so much that he will dominate the firm. The result of all this insecurity has been that the professional man must protect himself by every reasonable means and ensure getting a square deal in order that he may neither find himself unemployed nor "exploited" through fear of unemployment. The very circumstance that the membership of the British Association of Chemists is 1,718, an increase of 112 over last year's figure, is clear demonstration that the Association is doing work that the industrial chemists of this country find to be of value to them. Economic necessity has led chemists to lay aside professional pride and to adopt new methods of collective action.

Below the surface of these facts, however, there still lies the question whether the present situation is sound. To our mind it is unhealthy, not only in the chemical profession but in all professions. Undoubtedly there must be institutions responsible for the maintenance of professional standards and able to speak with a united voice when occasion arises. But the adoption of something resembling trade union methods should not be necessary. We do not necessarily blame the chemists; we may have to blame the employers. The chemist or physicist should hold a unique place in his employer's esteem and councils. He should be the constant adviser of his employer in every case of scientific doubt. The works chemist should occupy a place akin to that of a permanent consultant. His voice should be raised on every occasion in the interests of scientific truth. Too many employers regard the chemist as similar to other workers in his factory or office.

Setting a Higher Professional Standard

IT used to be said that it was impossible to go through business without lying fluently daily in the interests of one's employer. That may or may not be

true to-day, but the chemist is too often treated as if it was. The chemist is not asked to find the truth, but to find that particular facet of the truth which will suit the case the employer wishes to make. When employers generally recognise that the scientific worker in their employ has to maintain a high standard of scientific accuracy, and yet within those limits he is working wholly for the success of his employer's business a more healthy state of affairs will prevail. Many employers take this view—but there are others. Our point is that although the chemist just now is constrained to regard himself as being no different from other men, he should in point of fact occupy a special position. The exhortation " you owe it to the profession," should be sufficient to ensure that the chemist has a higher standard of professional honesty and fair dealing than have other, non-professional, employees. To take a case in illustration; how often does it happen that an inventor comes to a firm with a new process. The patent usually does not tell the whole story, and the inventor must disclose more before the manufacturer can decide whether to take it up or not. It should be possible for the inventor and the firm's chemist to talk the whole process over and to try it out without the details being given to the firm if the chemist decides against the adoption of the process.

That should be the standard of professional etiquette of the industrial chemist, and would be of immense value to the poor inventor, even though the firm would thereby lose an opportunity of obtaining free information which they might one day work up into a similar process without paying royalties. So long as the chemist considers himself as similar to any other worker, so long will the recognition of this professional attitude by the employers in general be delayed. To set a higher professional standard is the pressing task of the chemical profession; to educate the employers up to that standard is the most difficult part of the task. Trade union methods may be necessary for a time, but we hope to live to see them abandoned in every profession. Perhaps restriction of the number of entrants to those who can usefully be employed in the higher grades, who alone should be entitled to the designation of " Chemist," might be the ultimate way to salvation.

Chemical Engineering Education

WHEN the American Institute of Chemical Engineers held its recent winter convention at Pittsburgh its members were presented with copies of a booklet on " Chemical Engineering Education: Experiences in Pittsburgh," reviewing the development of educational facilities in general and those offered at the Carnegie Institute of Technology and Pittsburgh University in particular. It is certainly a commentary on the inertia of educational institutions in the United States to note that during the past remarkable century of chemical manufacturing development no school in the States had, by the nineties, offered a course in chemical engineering except the Massachusetts Institute of Technology. Throughout the period of the development of America's heavy chemical industry, chemists were being trained, but not chemical engineers. The term was as yet not used. Most of these men were chemists, some were pharmacists, but all made themselves engineers—chemical engineers—when they took a process which was first worked out in the laboratory and developed the equipment and operating details necessary for large-scale operation.

During the nineties and the first decade of the twentieth century many institutions began the arrangement of courses labelled industrial chemistry. These courses usually represented the efforts of chemists to train men for the chemical industries. In the United States the cleavage between the two professions, chemistry and chemical engineering, took place with the formation in 1907 of the American Institute of Chemical Engineers. A good course in chemical engineering is best built up on the premise that it should contain chemistry, mathematics, physics, mechanics, drawing, and certain engineering subjects, particularly from the mechanical and electrical fields as well as the unit operations of chemical manufacturing, a subject of recent development and belonging peculiarly to the chemical engineer. The course in chemical engineering at the Carnegie Institute of Technology has been offered since the opening of the school in 1905. It has improved with the years, and to-day, with a new chemical engineering laboratory, is in a better position than ever. The course is a broad one. A survey of two hundred and three graduates of this department showed the following distribution: 77 in chemical plant operation, 43 in development and design, 26 in chemical sales, eight in research work, nine working as chief chemists in industrial laboratories, 10 working as analytical chemists, 12 engaged in teaching, one in editorial work on a technical paper, two practising patent attorneys in chemical cases, and 15 in lines other than chemical.

Safety in Welding

AT nearly all chemical works there is work to be done in repairing tanks and containers. A large proportion of this work is now done by the oxy-acetylene welding and cutting process. In this connection it should be impressed upon the welder and other employees in the works that every tank and container, particularly those which have been out of service for some time, is a potential source of danger when welding or cutting is to be done. Discarded drums are particularly dangerous, for drums have relatively small openings and this means that there has been little or no circulation of air inside the drum. Many such drums, moreover, have possibly been used for inflammable liquids now that organic solvents are a common feature of a modern chemical works. All these solvent liquids are volatile, in some cases they are inflammable, and in most cases the vapours which arise are heavier than air. In consequence, many discarded drums are partially filled with an inflammable vapour unless they have been specially cleaned; in other circumstances, they may contain the residue of a liquid which will produce an inflammable vapour as soon as the heat of the welding flame is felt. No such drum is safe for the welder until he has taken steps to remove any liquid or vapour which may possibly be present. Live steam, when available, can be used to remove vapour and liquids which are easily volatile. A strong solution of caustic soda will remove most of the heavier oils. But even after this safety precaution the drum should be party filled with water—if possible—before starting to do anything which involves the use of a flame or which might cause a spark. The same remarks apply to tanks and other containers which have been in use for a known or an unknown purpose.

The British Industries Fair, 1935

BUYERS from no fewer than seventy different countries are represented among the visitors now in London for the British Industries Fair, which opened at Olympia and the White City on Monday and continues until March 1. The Fair—the twenty-first of the series—opened without ceremony, but with all the exhibitors ready to receive buyers. At the textile section at the White City the Duchess of York was one of the earliest visitors, but her tour of the stands, in accordance with the practice of the Royal Family, was informal. The Queen visited the Olympia section of the Fair on Tuesday. Speeches associated with the start of the Fair were reserved for a luncheon at the White City and the banquet given by the Government at the Mansion House on Monday evening.

The First Day's Attendance

The first day's attendance before the general public were admitted at 4.30 p.m. included 1,228 oversea buyers and 6,454 home buyers. Sweden was represented by a party of nearly 70 business men who came to the Fair as a body, and there were buyers from Australia, New Zealand, Holland, Belgium, France, Spain, Poland, Persia and Hong Kong. Sir David Murray Anderson, Governor of Newfoundland, with the Newfoundland Trade Commissioner, Mr. D. K. Davies, visited the Newfoundland stand in the Empire section and congratulated those responsible on the varied character of the display. They were informed that satisfactory inquiries for canned goods had been received from France and Egypt. Another visitor to the Empire section was the Polish Minister of Commerce. At the Canadian stands he sampled a new drink which has the soya bean for a base and is flavoured with chocolate. The Fair, it may be noted, has aroused considerable interest this year among industrialists in Canada. This is shown by the participation of some 50 individual Canadian manufacturers, who are showing among other things dolls, slippers, soap, varied forms of rubber ware, food products, and plywood packing-cases capable of resisting exceptional pressures. Australia for the first time is exhibiting in this country kangaroo skins made up into fur coats, ties and muffs. The Olympia section of the Fair, to a greater extent than in any previous year, demonstrates what British manufacturers engaged in the lighter industries of the country have to offer to the home and foreign markets. The products of the newer industries attract particular attention, but a wide range of trades is represented.

Largest Fair in the World

The British Industries Fair, organised by the Department of Overseas Trade, is now the largest national trade fair in the world. The lighter manufactures of the United Kingdom and the products of the Dominions and Colonies are housed at Olympia, and textiles and furniture are shown at the White City. Only the actual manufacturer or producer of any article, or the sole agent for it, it allowed to exhibit it, and there is thus no duplication of exhibits. The first Fair was organised by the Board of Trade in 1915 and was held at the Royal Agricultural Hall. Only five major industrial groups were then represented, and the exhibits occupied an area of about 88,000 sq. ft. In 1920 the hardware and engineering section at Birmingham was inaugurated and the combined exhibits occupied 310,088 sq. ft. This year the area of the exhibits at Olympia and the White City is 525,000 sq. ft. There are 1,572 exhibitors this year against a total of 591 in 1915, and there are larger displays, compared with 1935, in sixteen of the twenty-four sections. Some idea of the size of the Fair and of the great range of exhibits, which cover 12 acres, is given by the following facts: Twenty-one miles of canvas, six feet wide, are needed to cover the 1,572 stands; one hundred and sixty-one miles of electrical wiring and 15,000 lights have been installed; twenty thousand workmen have been employed in building and equipping the stands; the jewellery alone has been insured for £250,000; the furniture section alone covers double the area occupied by the entire Fair 20 years ago.

Lord Derby presided, and Mr. Walter Runciman, president of the Board of Trade, was the chief guest, at a luncheon given at the White City to mark the opening of the textile section of the Fair on Monday.

A Good Start at Olympia and the White City

Mr. W. THOW MUNRO, who proposed the toast of "Success to the British Industries Fair," said that they heard a great deal about new industries to-day, but they ought not to forget the old ones. One out of every 10 persons employed in this country was employed in the textile industry, and 33 per cent. of the total manufactured exports of the country were textiles. What the textile manufacturers wanted was that the doors of foreign markets should be open to them so that they could get goods in and get their money out. Some doors had been opened in the past year to a certain extent, but not quite so fully as they would like them to be.

Breaking Down the Barriers

Mr. WALTER RUNCIMAN, who replied, said that when the Fair started they had in mind the intention or regaining lost home markets. Very rapidly, however, that became too small an ideal, and more and more attention was given to foreign travellers who came to this country. Unfortunately, markets abroad were not open to us with anything like the freedom we could wish; wherever we went we found the spread of economic nationalism interfering with a sound trade policy, and again and again we had seen promising openings closed with the banging of the door at the very moment when we had hoped to be allowed to sell freely. It had become clear that, unless we had some means of bringing pressure to bear, we were not likely to succeed in stabilising or lowering tariffs. He was afraid there were a great many Ministers on the Continent and in America who used to smile at us. They thought we would adhere to the principles on which our grandparents had been brought up and that they had no need to worry about competition from us. Some of those Ministers got a rude shock about the end of 1931. It was not in antagonism to foreign goods that we took up a new line of policy, but rather the beginning of an idea of doing good to the whole world by breaking down the barriers of international trade.

There were signs in many quarters that we had succeeded in overcoming obstacles to foreign trade which had been a curse not only to this country but to the whole Europe for 50 years. The Government had succeeded in making trade agreements now with 14 different countries and were going on with them month by month. On Wednesday this week they would initial a new agreement with Poland, under which he thought there would be a reduction of tariffs in respect of about 200 categories of goods. These agreements would give to a great many business men a chance they had not had before. In the long run, however, there was no doubt that the things which mattered were high quality and low prices. What they could say to visitors to the British Industries Fair was that here was a magnificent show of high-quality goods and that prices were lower than anywhere in the world with one exception.

The Government Banquet

Mr. Walter Runciman, president of the Board of Trade, presided at the Government dinner at the Mansion House on Monday evening in celebration of the opening of the Fair. The guests included many members of the Diplomatic Corps, official representatives of India, the Dominions and other parts of the Empire, as well as leaders of commerce and industry at home and abroad.

LORD DERBY, proposing the toast of "British Industry and the British Industries Fair," said he thought they could view the future with some measure of optimism, and he said so advisedly and with restrained but real confidence. He had no wish, nor he was sure had those who were most intimately connected with the wide field of export trade, to minimise difficulties. We had not emerged from the depression—no country had; but they could surely say that they had weathered the worst of the storm and were now sailing towards prosperity, though the waters were still troubled. The forces against them might well have been insuperable had the courage of the race weakened or its genius become dimmed. Not in one industry but in a hundred which must

always face the competition in oversea markets of formidible and well equipped, and often subsidised, rivals the depression itself was turned to good account in that it stimulated those in charge to greater efforts. Indefatigable research, originality of outlook among the experts, the swiftness of boards of directors to adopt new scientific and mechanical methods, the combination of resources when the need had arisen, the willingness to take reasonable but real risks, improved selling and advertising methods, of which surely the British Industries Fair itself was a shining example, had made it possible for them to offer the world the products of a thousand varied factories and workshops, still at competitive prices, and still bearing the hall-mark of sound British quality.

Building up Prosperity

After instancing the Ottawa agreements and the various trade agreements with foreign powers as aids in the struggle for the recovery of export trade, Lord Derby said that such aids to industry, important as they were, must always be a secondary factor in the building up of a nation's trade prosperity. They must do more than dig channels for the delivery of their goods. They must deliver them. And that he thought was what the Fair showed they were doing—full measure and running over. The road to full recovery must necessarily be difficult. It would be wrong, after the recent lean years, to expect recovery in trade to occur in leaps and bounds. The effects of the prolonged depression would not quickly cease to be felt. It was only by continued goodwill and by nation working with nation as closely as possible, with the mutual desire to remove restrictions which impeded the transaction of an increased volume of trade, that the world could regain the major part of its lost prosperity.

Mr. RUNCIMAN, in reply, said that the interest shown by the King and Queen and every member of the Royal Family year by year in the Fair afforded encouragement to the thousands of exhibitors and to all responsible (in London, Birmingham, Manchester and elsewhere) for its organisation. When the Queen had completed her three visits to the Fair this week she would have paid no fewer than 29 visits to the Fair in London since its inception in 1915. Mr. Runciman extended a cordial welcome to the distinguished oversea guests—representatives of foreign Sovereigns and States, and representatives of the Dominions and India and of many of our oversea possessions. They were, he said, also glad to have with them many important oversea representatives of commerce and industry.

Unprecedented Demand for Space

The Fair continued to grow, and there were nearly 1,600 exhibitors in London, whose exhibits occupied an area of nearly 526,000 square feet, compared with an exhibiting area of 480,000 square feet in the Fair in London in 1934—an increase of 9 per cent. The unprecedented demand for exhibiting space made it necessary to take an additional exhibition hall to accommodate the greatly enlarged furniture section. In view of the decision of the Birmingham management to hold what was now to be known as the engineering and hardware section of the Fair in May (instead of, as had been always the practice previously, simultaneously with the Fair in London in February), it was not possible to state what the occupied exhibiting area in the engineering and hardware section would finally be, but the whole of the indoor area, which totalled 265,000 sq. ft. had been let already. The demand for space had been so great that the Birmingham management had found it necessary to increase, from 80,000 to 200,000 sq. ft., the out-of-door exhibiting area to be available in May. The total occupied area of the section in 1934 was 345,000 sq. ft., while the exhibiting area at Birmingham already let, or in negotiation, approximated to date to 365,000 sq. ft. Not only, therefore, was the Fair in London this year a record in size, but the Fair as a whole in 1935 would be by far the largest Fair held up to date. The area of the Fair in London was nearly six times the size of the first Fair.

A Visitor's Impressions of the Fair

Is the Chemical Industry Missing its Opportunity?

NO one in any way connected with the chemical industry, whether as a manufacturer of chemical products, a merchant or a user, can fail to be impressed with the favourable geographical position occupied by the chemical section at the British Industries Fair at Olympia. Occupying one of the best positions in the Grand Hall, not far from the main Addison Road entrance, it is actually about 10 per cent. larger in floor area than it was twelve months ago, and one therefore does not immediately realise that the section is in reality smaller in regard to the number of firms exhibiting than it was in 1934. The layout of the section is only slightly different, but when one sets out to examine what the exhibitors have to display there is conclusive evidence of progress in the number and applications of the chemical products offered. THE CHEMICAL AGE last week gave such a complete list of these wares that there is no need to enumerate them here, but it is true to say that no previous Fair has ever shown more evidence of scientific development. The Association of British Chemical Manufacturers deserves congratulations upon the general arrangements for the section, and whatever criticism may be passed upon the industry as a whole must not be taken to reflect upon the Association, which, after all, renders to the industry just that degree of service it requires.

Meeting Competition

The Fair which opened on Monday displays to the world a selection of the goods which this country produces. Britain's shop window, as the Fair has well been styled, is filled both with novelties and with staple products, and a nation of shopkeepers, proud of this title, invites the old customers and many new ones to inspect its wares. Severe competition now meets the old firm in many directions where once it had a virtual monopoly, but the quality of its goods and the efforts of its salesmen have alike been braced to meet the newcomers. That its stability is not merely unshaken but enhanced may be deduced from the fact that the British Industries Fair is now the largest of its kind in the world, six times the size of its forerunner of twenty years ago and increased by 9 per cent. beyond last year's record display.

The growth of the British Industries Fair, ably fostered by the Department of Overseas Trade, may be attributed in part to the increasing recognition of its value by the manufacturers. Without this recognition, in itself a symptom of the new impetus given to salesmanship, British trade might conceivably have turned the awkward corner where it lagged a few years ago, but its progress would have lacked this visible focus. But, in fact, British industry and the British Industries Fair are going forward in mutual encouragement, and the growth of the display is a token of the new bustle and stir which reaches far beyond the goods for the consumer exhibited or the factories which supply them. Behind the manufacture of the wares to be seen now at Olympia and the White City stands that great engineering industry which will later hold its own section of the Fair at Birmingham.

Some Famous Firms Not Represented

The atmosphere of the British Industries Fair is an admirable one in which to reflect upon the greatness of Britain's industries. We were reminded the other day that our exports of chemicals, drugs, dyes and colours during 1934 were worth £19,565,890, quite apart from the vast production that was necessary to meet home demands. The chemical industry is one of the most important in the country, and there is a feeling that the display which it makes at the British Industries Fair does not adequately reflect that importance. Some of the largest and most famous firms are not represented at all—a half-dozen names at least spring to the mind at once—and in consequence the official chemical section fails to make that deep and lasting impression which it should. The firms which persistently exhibit year after year and demonstrate their development and progress are

few in number, and they are already showing a tendency to diminish. The manufacturers of chemical plant are conspicuous by their absence, only two of the 48 member firms of the British Chemical Plant Manufacturers' Association featuring in the list of exhibitors. The "man in the street" glances at the chemical section and utterly fails to grasp any idea of the ramifications of the industry it represents.

Surely the time has come when the whole chemical trade and the allied industries, such as the soap, perfumery, pharmaceutical, plastics and paint interests should associate and produce an exhibition worthy of the industry. In the chemical section you have a firm producing perfumery chemicals, and away in some distant section the finished product is on view. The same thing happens with regard to soap ingredients, fillers, pigments, essences, etc., and some real effort should be made to co-ordinate these different interests in order to present to the Empire an understandable panoramic picture of the services which the chemical and allied industries are waiting to render.

Chemicals in Industry and Agriculture

The theme of the stand of Imperial Chemical Industries, Ltd. (No. A97 and 101) is the presentation of the sales machinery of the company rather than its products. A large map shows how I.C.I. products enter into almost every trade and industry in the country—that is to say, into the manufacture of articles in all sections of the Fair. Relief maps also show the eight I.C.I. sales divisions into which the British Isles are divided. As regards I.C.I. production, prominence is given to two aspects of particular interest and under special development at the present time. One is sodium carbonate monohydrate, a new alkali product of exceptional purity and attractive appearance. It is being manufactured in five distinct sizes of rounded crystals and should prove of great value in the production of bath salts and toilet preparations, particularly for tropical conditions, by reason of its great stability. It is being used in the fine chemical industry and is likely to be increasingly employed with regard to foodstuffs and photographic materials.

"Sesqui" (Sesquicarbonate of soda) is also shown. This is a very pure and stable form of mild alkali and is particularly useful in the manufacture of toilet preparations, bath crystals and cosmetics. Its glistening crystals have a marked sheen and it can easily be coloured and perfumed.

The searchlight of public attention directed upon the slum areas of this country has revealed the distressing fact that many of them are bug-infested up to percentages as high as 80 per cent. of the houses. The problem of preventing reinfestation of the new properties is therefore of great importance. Infestation is spread chiefly by the removal of infested furniture from one house to another and the general procedure is to treat the furniture and other goods in a special removal van at a fumigation centre en route. So far as fumigation itself is concerned, the most practicable and only reliable method is treatment with hydrocyanic acid. An exhibit of hydrocyanic acid is staged on the I.C.I. stand. Bedbugs themselves are shown in various stages of development—eggs, adolescent bugs and adults—and a number of plates describe their life history and the method of fumigation.

The hydrocyanic acid method is the only one that gives 100 per cent. control and it has already been adopted by many municipalities. Liquid HCN may be used, or Zyklon, which is HCN absorbed on kieselguhr. An adjunct of the standard method of hydrocyanic acid fumigation is fumigation with orthodichlorbenzene (o.d.c.b.). This is being used successfully where, for example, there is a single infested flat in an occupied block not scheduled for demolition.

An example of the varied uses and scope of chemical products is given by the illustration in the same exhibit of another aspect of hydrocyanic acid fumigation, the treatment of orange groves—a subject of special interest to visitors from overseas. This is the standard method of citrus fumigation against scale insects causing blemishes and damage to the fruit. The original "pot" method of fumigation is now being superseded by the modern method, depicted on the stand, of pumping in liquid HCN with a special pump.

A Look Round the Other Sections

THE CHEMICAL AGE last week gave a general review of the exhibits in the chemical section at Olympia. As the writer of a special article in the preceding page points out, however, there is a good deal more to interest the chemical manufacturer and the chemical user than is to be found within that one section. Scientific instruments, soaps, perfumes, artificial silks, paints and colours, plastics and rubber goods all have a definite point of contact with the chemical industry, and below we give brief notes of features found in some of the other sections of the Fair.

ABERDEEN COMBWORKS CO., LTD. (F65).—The main feature of this stand is "Keronyx," a non-inflammable substitute for ivory, vulcanite and celluloid. The product can be used for drinking cups, shoehorns, etc.

BAKELITE, LTD. (F148).—Synthetic resin products in their most varied forms are shown, as well as the varnishes, lacquers and cements made by the firm.

CHARLES BAKER (A122-A125).—The wide range of instruments and microscopes made by this firm is fully shown in a display of epidiascopes, photomicrographic apparatus and projection apparatus.

BEAUCAIRE LABORATORIES (E57).—One of the most interesting of the new preparations shown at the Fair is "Beaucaire." This is a composition for both factory and household use: it removes grease, tar, oil, dirt and stains from silks, woollens, carpets, upholstery and wallpaper. It is one of the most reliable removers on the market and is non-inflammable.

R. AND J. BECK, LTD. (A122-A125).—Optical units of good quality are the need of scientists in any sphere. A full range of units in glass, quartz and Iceland spar is shown on this stand, together with opaque projectors and optical systems.

BEETLE PRODUCTS, LTD. (F10).—Synthetic resins, Urea resins for lacquers, coloured and white moulding powders, and moulding powders in opaque colours are shown.

BELLCHAMBERS GLASS BOTTLE CO., LTD. (D53).—A display of bottles of all descriptions is the main feature of this exhibit. Specialities of the firm include highest quality sprinkler-topped perfume bottles and patent cap chemical bottles.

BELLINGHAM AND STANLEY, LTD. (A208).—This firm is showing instruments for investigating ultra-violet and infra-red spectra. It also has a display of polarimeters, saccharimeters, refractometers, spectrographs, spectrometers and photometers. A spectro photometer is provided with a glass circle which carries the dividing, and readings can be taken using light transmitted through the glass. A quartz spectrograph is available to photograph the spectrum between wavelengths 10,000 Å and 2,100 Å. It is fitted with a new type of symmetrically-operating slit, and the illumination of the slit can be controlled up to the time of exposure.

BRITANNIA RUBBER AND KAMPTULICON CO., LTD. (White City 18).—This firm which makes Britannia oilsilk is the original producer and manufacturer of oilsilk for curtains. The main feature of the stand is a unique range of modern shades and latest printed designs, including the new opaque oilsilk.

BRITISH FUMIGANTS CO., LTD. (E70).—These manufacturers of Vermicine, the insecticide with a high killing power, are also exhibiting cetyl solid pine, a powerful deodorant, and pine disinfectants and perfumed sprays for all purposes.

BRITISH TITAN PRODUCTS CO., LTD. (A40 and A52).—The exhibit of these paint manufacturers includes as well as paints and lacquers, rubber, paper, plastics and ferrous sulphate.

CASELLA, C. F., AND CO., LTD. (A122 to A125).—Thermometers of all descriptions as well as hydrometers, meteorological instruments and surveying instruments are shown by this firm of scientific instrument makers.

CHANCE BROTHERS AND CO., LTD. (A122 to A125).—This firm, makers of "Chance-Parsons" optical glass are exhibiting plates and blocks for the optical instrument manufacturer, Crookes glass, rolled and figured glass, and coloured glass in optical quality.

CUPRINOL, LTD. (A46 and A47).—The main feature of this stand is "Cuprinol," a liquid which protects timber against dry rot, the attack of the white ant, marine borers and all wood-destroying organisms. Fungicides and insecticides are also exhibited, with special brands of Cuprinol for the protection of canvas, ropes and netting.

DUNLOP RUBBER CO., LTD. (White City 543).—The principal feature of this stand is the new Dunlopillo cushioning, the new cellular latex upholstery filling which has revolutionised former ideas of luxury and hygiene. The new material is permanently resilient, automatically ventilated and practically everlasting.

DURO-RAY, LTD. (A65 and A110).—The Duro-Ray patent process for silvering glass mirrors ensures 100 per cent. light-reflecting value under any atmospheric conditions either at

home or abroad. The stand consists of an exhibition of silvering as carried out by the process.

FORD, T. B., LTD. (B98).—Filter papers, of use in every class of science, have to be of a consistent quality when used for chemistry. Those shown on this stand are of all degrees of fineness and serve a wide range of uses. Fords are also exhibiting blotting papers, rag blotting papers, pulps and writing inks.

FRICKER'S METAL AND CHEMICAL CO., LTD. (A46 and A47).—The exhibit consists of a display of the chemicals used in the paint, rubber, ceramic, glass and soap industries. This firm also manufactures zinc oxide; pharmaceutical quality for zinc ointment and cosmetics; and zinc dust for the mining and paint industries.

GUELPH PATENT CASK CO., LTD. (D43).—Guelph casks are cylindrical barrels for dry goods, such as pastes; they are both light and strong, being made from Empire-grown timber. If necessary, they can be supplied dustproof and are made in various styles and in over 400 sizes.

HANOVIA, LTD. (A142).—The first exhibition in Britain of the new high-pressure electronic discharge mercury arcs is being made on this stand. The firm is also showing medical and scientific lamps.

HIGH SPEED STEEL ALLOYS, LTD. (A50).—The three main products of this firm consist of tungsten, vanadium and molybdenum; also their oxides and other fine chemicals.

HILDRED BROS. (F14).—These manufacturers of moulds for bakelite and allied materials are also exhibiting steam-heated auto-cellulose moulds and cellulose acetate injection moulds.

HOPE'S SOAPS (E78).—Soaps of all types are shown, fine toilet, shaving, household, and hard and liquid.

HUGHES, F. A., AND CO., LTD. (F147).—This firm manufactures plastic moulding compositions, "Rockite" phenol formaldehyde moulding powders and resins, and "Cellomold" cellulose acetate moulding papers.

INDRA LABORATORIES (E58a).—The main object of interest on this stand is the description of the Indra Radium Treatment. Indra Hermone cream is also made as well as Indra lip-stick.

INTERNATIONAL BOTTLE CO., LTD. (D42).—One may see bottles at this exhibit in white, opal and coloured glass, with Beetle closures, and ampoules and tubes for the druggist and perfumery trades.

JOHNSON, MATTHEY AND CO., LTD. (D37).—Melters and assayers to the Bank of England, this company, besides producing chemical plant, carries on the business of refiners, sweep grinders, smelters, rollers, wire drawers of precious metals, manufacturers of precious and rare metal salts, ceramic products, magneto contacts and high-precision screws for wireless, optical and scientific work.

KENT MOULDINGS (F15).—Manufacturers of synthetic, urea and phenol mouldings of all types, this firm specialises in mouldings for the electrical and mechanical trades and high-class translucent work for the luxury and perfumery trades.

MAGNESITE SYNDICATE, LTD. (A16).—Magnesite to fulfil any and every requirement is shown here. The firm are producers of crude magnesite for chemical and pharmaceutical purposes; caustic calcined magnesite for composition flooring (oxychloride cement), millstones, paper mills and glass works, and hard-burnt magnesite for refractory purposes. Mabos brand cupels are also supplied as well as assay material.

MIDGLEY, CHARLES, LTD. (E79).—The main contribution to this stand is that made by soap; fine toilet soaps, medicated soaps, shaving soaps, soap models, household soap and soap flakes. General toilet preparations, however, as well as face creams and perfumery are shown.

NATIONAL SMELTING CO., LTD. (A46 and A47).— Manufacturers of super refined zinc (99.99+ per cent.), high-grade zinc, G.O.B. zinc, and zinc alloys for casting, this firm also makes sulphuric acid, oleum and accumulator acid.

OZONOL LABORATORIES (1930), LTD. (E59).—Ozonol air purifiers (germicidal deodorisers) are shown as well as Ozzo air spraying essence. The firm also makes Ozonol hygienic phoncaps for fitting to telephone mouthpieces, and a bath lotion, Ozonol bath milk.

PIONEER MAGNESIA WORKS (A43).—The main product of this firm is magnesium chloride, solid fused and crystal-fused crystals; they also manufacture magnesium sulphate.

POTTER AND MOORE, LTD. (E66).—The display of these manufacturers of Mitcham lavender and "Blue Ribbon" eau-de-cologne includes floral perfumes and a complete range of toilet specialities, including the new powder-cream.

POWELL DUFFRYN STEAM COAL CO., LTD. (A73 and A82.)—This company is mainly tar-producing, manufacturing refined tar; Synthatar, a synthetically-refined tar; Synthacold, the cold form of Synthatar, and pitch. They also produce crude whizzed naphthalene salts, winter washes, sulphate of ammonia, Presotim, Presomet and Sythaprufe.

STANLEY, W. F., AND CO., LTD. (A122 to A125).—This exhibit consists of scientific instruments of all types, including binoculars, drawing instruments, Fuller rules, hydrometers, lenses, mathematical and meteorological instruments, microscopes, planimeters, telescopes and thermometers.

SWIFT, JAMES AND SON, LTD. (A208).—Microscopes for biology and medicine, petrology, mineralogy, metallurgy; photomicrographic and projection apparatus; optical measuring and testing instruments; spectroscopes, calorimeters, refractometers, polarimeters, strain viewers, nicol prisms and optical elements; all are shown on this stand.

WATSONS LABORATORIES, LTD. (A21a).—This exhibit consists of a display of chemicals used in water softeners.

WATSON, W., AND SONS, LTD. (A122 and A125).—Microscopes and all accessory apparatus are shown on this stall. Also optical elements for all physical work, and telescopes, binoculars, photographic lenses and prisms, cameras, optical benches and optical munitions.

WATTS, E. R., AND SONS, LTD. (A122 and A125).—Among the most interesting of the new instruments in the exhibition are those on view at this stand. These include torsionmeters for accurately measuring the torque on shafts, inclinometers for testing verticality of bore holes, and instruments for geophysical surveying.

WEBB, WILLIAM A., LTD. (A122 to A125).—Balances of all types are included in this exhibit, including those for analytical, research, assay and general laboratory use; students' balances of all types, balances and scales for dispensing and medical purposes, and estimating and counting scales.

Water Pollution in Yorkshire

Summonses Against Tar Distillers Dismissed

THE Hull Stipendiary Magistrate, Mr. J. R. Macdonald, on February 14 ordered the Yorkshire Fishery Board to pay £10 10s. costs on each of three summonses which they had brought against a local firm for water pollution, and which he had dismissed.

The firm were E. Hardman, Son and Co., Ltd., tar distillers, Bedford Street, and the offences alleged against them were that in July and August, 1934, and January, 1935, they permitted to flow into the Sutton Drain certain matter to such an extent as to cause the waters to be poisonous or injurious to fish, or spawning grounds. They pleaded not guilty. Mr. Norman Winning prosecuted, and Mr. Norman Black defended. Mr. Winning, in his opening, said that there had been a continuous flow that looked and smelt like tar, and his contention was it came from the defendants' premises. The fishing rights of the drain were held by a Hull angling association, which had 400 members. Robert William Fox, water bailiff, mentioned a day in August when, he said, the water near the defendants' premises was blue-black and there were hundreds of dead fish in it. There were pike up to 8 lb. and bream, perch and roach ranging from about 3 oz. to over a pound. He picked up forty and on opening one found it contained tar. Henry P. Hargreaves, York, Fishery Inspector, described a brown, oily liquid which he saw on the water and expressed the view that it had got there by seepage.

James M. Wishart, manager and chief chemist of the Shipley sewage works, gave the results of his analysis of samples of water taken from the drain; and Professor H. S. Holden, Professor of Biology, Nottingham University College, said such water would be toxic to fish. E. H. Rowley and E. Hardman, directors of E. Hardman, Son and Co., Ltd., said they regarded it as physically impossible for any pollution to enter the drain from their works. Thomas Sheppard, chairman of the Yorkshire Pollution Committee appointed by the Ministry of Agriculture and Fisheries, said the alleged pollution had not been brought to the notice of the committee. Water which had been admitted to the drain from the Humber would be salt and would contain sediment. Fresh-water fish would not live in that water.

The Stipendiary Magistrate, dismissing the three summonses, said he did not believe that tar pollution ran into the drain from Hardman's works.

Research for the Needs of Industry

Annual Report of the Department of Scientific and Industrial Research

A SUMMARY review of the work carried out under the various research organisations of the Department of Scientific and Industrial Research during the year 1933-34 is given in the Annual Report of the Department (H.M. Stationery Office, 3s. net).

At the National Physical Laboratory work on the constitution of the iron-manganese alloy system has been considerably assisted by the employment of X-ray analysis. The study of alloy systems involves the use of pure constituents, and the production of iron of high purity has received further attention. Analysis has shown that in the more recent samples of iron produced the total impurities, excluding oxygen, amount to only 0.012 per cent., the nickel present having been reduced to 0.0006 per cent. The study of the properties of molten metals and alloys has been continued. In this direction the determination of the surface tension of a number of lead-tin alloys up to a temperature of 800° C. and an investigation of the viscosity of molten tin has been completed. Experimental work has been carried out on the oxidation of both tin and bismuth, and in this work the use of electron beam diffraction apparatus has been tried. The volume changes of metals and alloys during solidification are being investigated at temperatures up to 700° C. by means of a differential gas calorimeter.

Production of Refractories

In many of these determinations, and also in the work on gases in metals, one of the difficulties lies in obtaining suitable refractory materials. The production of refractories impervious to gases and able to withstand high temperatures has been further investigated, considerable progress having been made with the production of articles of pure recrystallised alumina.

Under the Fuel Research Board the effect of introducing steam to the ordinary type of horizontal gas retort during the carbonisation of the coal has been further studied, and it is satisfactory to note that this procedure has now been successfully adopted by at least three large gas undertakings. The result is an increase of some 10 per cent. in the number of therms of gas produced per ton of coal. The method of increasing the throughput of the retorts by increasing the volume of the heating gases is also in commercial operation.

The work on the hydrogenation of tar to produce motor spirit has continued, and the semi-commercial scale plant designed to treat 300 gallons of tar a day is approaching completion. Further progress has been made in the study of the reactions involved in the hydrogenation of coal and the effect of the inorganic substances in the coal.

In the application of pulverised fuel to the needs of industry a new type of burner is now in commercial use and has given satisfaction. It is being further developed to increase its flexibility and in particular to enable it to deal with coals containing little volatile matter. There is no difficulty in dealing with coals containing 20 per cent. volatile matter, and promising results have been obtained with coal containing 15 per cent. There are many excellent "steam" coals of this type available, especially in South Wales and Scotland, which it has not been possible as yet to burn satisfactorily in a pulverised form in boilers with small combustion spaces, such as "Lancashire" and "Scotch Marine" boilers.

Lubricating Oils from Coal

Various other investigations are in progress dealing with the methods of examination of coal as regards its constitution, its chemical analysis and its suitability for various purposes. Increased attention is being paid to the production of lubricating oils from coal, or coal derivatives.

At the Low Temperature Research Station of the Food Investigation Board interesting observations have been made on the physiology of senescence in fruits. Ripe apples have been found to give off some substance which stimulates an irreversible change, termed, for convenience, the climacteric, which ushers in the senescent phase of life and which is accompanied by a marked increase in respiratory activity. It has now been shown that ripe bananas, peaches and pears also produce this or a similar substance. On the other hand, ripe oranges and grapes have not been found to have any stimulating effect upon pre-climacteric apples. Wounding and mechanical stimulation have no effect.

If apples are kept confined together in a group the climacteric occurs nearly simultaneously in each individual at about the time it is self-induced in the most advanced fruit of the group. The influence of carbon dioxide in the atmosphere is not only to depress post-climacteric respiratory activity but also to delay markedly the occurrence of the climacteric. Supernormal concentrations of oxygen in the atmosphere accelerate the occurrence of the climacteric, while subnormal concentrations delay it. In the absence of oxygen the climacteric is not induced by ethylene as it is in air, nor is there any latent stimulus, for on return to air after such treatment the apples are still pre-climacteric. Oxygen is therefore definitely concerned in the mechanism by which ethylene stimulates the climacteric.

The total volatile products of the metabolism of fruit, other than carbon dioxide, are now being measured, after combustion, as carbon dioxide. The production of these volatile products increases at the climacteric and a large part of them can be retained by phosphorus pentoxide or concentrated sulphuric acid.

Ethyl Alcohol in Apples

The effects of artificially raising the concentration of ethyl alcohol in apples by feeding them with the vapour have been studied. The amounts of alcohol that sound fruit will tolerate without injury are much higher than the quantities found in tissues killed by continuous exposure to atmospheres free from oxygen. This involves a revision of the view generally held up to the present, that death in the absence of oxygen is due to alcoholic poisoning. It has also been found that, in moderate doses, ethyl alcohol depresses respiratory activity, while in larger doses it increases it; finally, that a relatively small dose of alcohol causes a marked rise in the concentration of acetaldehyde in the tissues, while larger doses do not produce any greater effect.

The recent reorganisation of the pig and bacon industries has led to an increase in the demand for information on curing. Investigations on the rate of penetration of salt during curing have been carried out in collaboration with the British Food Manufacturers' Research Association. Results showed the value of an initial pumping of the sides with pickle in the case of both tank-cured and dry salt-cured bacon. Pumping leads to a more rapid penetration, and also to a more even distribution of the salt in the matured bacon.

It has been found possible by storing bacon at +5.5° C. in an atmosphere of carbon dioxide, in a small gas-store especially designed for the purpose, to keep it an extra three weeks after maturation without any development of slime. For longer storage a lower temperature is needed, and a side of mild-cured Wiltshire bacon was stored in carbon dioxide at −11° C. for eight months, at the end of which period it was indistinguishable from normal bacon, even chemical tests failing to detect any rancidity in the fat. The fat of bacon is more susceptible to the oxidative changes leading to rancidity than that of pork. Work on lard has shown that the salts used for curing are responsible for accelerating these oxidative changes, and that yellowing can be produced in oxidised fat by traces of alkali or of ammonium salts. A study is being made of the effect of anti-oxidants on this type of oxidative change in fat with a view to delaying the onset of rancidity during the storage of bacon.

Food Canning Practice

In canning practice, work on the passage of hydrogen through steel has shown that a perfect coating of tin would probably prevent the passage of hydrogen, but that the normal tin coating is sufficiently porous to permit it. It has also been shown that a coating of lacquer as used in the canning industry interferes hardly at all with the passage of hydrogen; the lacquer is not loosened, as is often the case with glass enamels, but hydrogen appears to diffuse through it.

The novelty of this work lies in the fact that the diffusion of hydrogen through steel has not previously been considered in relation to corrosion in canning. It probably accounts, however, for the fact that hydrogen-swells do not burst. The formation and distribution of hydrogen-blisters in steel also suggests a relation to perforation in canning. The lag in the formation of hydrogen-swells, due to the use of sugar containing an inhibitor of corrosion, has now been demonstrated for most of the fruits canned in lacquered cans in this country.

Tests on the lead peroxide method of estimating sulphur pollution of the atmosphere continue to be carried out by the Building Research Board in conjunction with the Atmospheric Pollution Research Committee. The method is now in regular use at a number of centres and is also being employed for certain special purposes in connection with research on the corrosion of non-ferrous metals, the durability of leather in libraries and the recording of pollution emanating from a localised source.

Chemical Resistance of Concrete

Considerable attention has been paid during the year to the examination of available data on the resistance of concrete to chemical attack. In regard to the constitution of cements, investigations have been completed on the phase relationships in that portion of the system $CaO—Al_2O_3—SiO_2—Fe_2O_3$, of importance in connection with Portland cement manufacture. The study has been continued of the constituent compounds of set cements, on the dehydration of these compounds and on the hydration of high alumina cement. An investigation has been conducted into the effects of storing lime, lime-pozzolana, cement and cement pozzolana mortars in an atmosphere of carbon dioxide. The research on pozzolanas commenced five years ago in co-operation with the industrial interests concerned has now been completed and a series of reports is being prepared for publication.

An investigation, under the Forest Products Research Board, originally undertaken with a view to the discovery of the nature of the binding forces between wood and water, has shown that practically all the water up to the fibre saturation point is held by adsorption and that the method employed in the investigation has immediate applications of a practical nature in affording a means of measuring directly the fibre saturation point of various woods. Experiments have demonstrated that the common belief that timber becomes less affected by changes of moisture content as it ages has no foundation in fact, and that there is no material difference between old and new timbers in the amount of shrinkage or expansion which takes place with a given variation in moisture content.

Investigations on electro-deposition problems have been continued throughout the year at the Research Department, Woolwich. The examination of the effect of additions of oxidising agents on the properties of the deposit has been completed, and a report upon the results is in preparation. Data have been collected on the effect of a large number of substances, both organic and inorganic, on the appearance of a deposit, including such materials as might be present in a depositing solution under commercial conditions. Methods of removing deleterious impurities from nickel depositing solutions have been studied. Non-porous nickel coatings far thinner than those obtained under ordinary commercial conditions have been successfully produced by careful control of the conditions of cleaning and deposition and by the use of electrolytic iron as basis metal. Some further work has been carried out on electro-deposition of chromium.

Purification of Dairy Effluents

For the Water Pollution Research Board, further progress has been made in experiments at the Rothamsted Experimental Station on the conditions affecting the purification of effluents from dairies and creameries by a process involving anaerobic fermentation followed by biological oxidation of the resulting liquid. Anaerobic fermentation of the waste liquids from milk collecting and distributing depots causes separation of most of the fat and some protein. The separated liquid can then be readily oxidised, with an efficiency of about 99 per cent., in percolating filters. Experiments have also been carried out on the treatment of milk effluents by the activated sludge process. The investigation has definitely reached a stage at which it could with advantage be extended to include experiments on a large scale.

Experiments have also been made at the Rothamsted Experimental Station on the biological oxidation of aqueous solutions of sodium stearate alone and in admixture with domestic sewage. This work was undertaken because fats and soaps are constituents of sewage and of certain trade wastes. The results have shown that the presence of sewage facilitates the oxidation of soap, and that sewage containing 25 parts of sodium stearate per 100,000, a concentration much higher than is usual in domestic sewage, can be readily oxidised in percolating filters.

A long investigation into the nature of the colouring matter present in the heavy oils of low-temperature tar has culminated in the demonstration that these coloured substances are hydrocarbons of the naphthacene class. The main coloured constituent is 2 :6-dimethylnaphthacene which has also been prepared synthetically together with several other members of its class. Several new homologues of phenol have been synthesised and compared with the higher tar acids of low-temperature tar. The mixture of higher tar acids used as a wetting agent under the name of " Shirlacrol " has been obtained in considerable quantities from both low-temperature tars and vertical retort tars. Several technically important intermediates have been produced by aminations under pressure from resorcinol. The aqueous liquors of the "Coalite" variety of low-temperature tar have been shown to contain notable quantities of phenol and catechol. A complete series of nitration products of symmetrical xylidine has now been prepared.

Synthetic Resins

In regard to synthetic resins, the interactions between formaldehyde and the homologues of phenol have been studied systematically and several new intermediates have been isolated. These reactions are carried out in the presence of catalysts and a quantitative study of these effects has been undertaken. Polyhydric phenols readily condense with formaldehyde to form resins which have remarkable adsorptive powers for metallic cations, a property of significance in water purification. Further work on ketone-formaldehyde resins has shown that a resin having useful machining properties is obtainable from methyl ethyl ketone and formaldehyde. In pursuance of these researches a convenient method for preparing hydroxyacetone (acetol) has been discovered.

Further work on the production of a suitable respirator for use in industry as a protection against the inhalation of dust has been undertaken. The respirator to which reference was made last year proved to be satisfactory for use in a large proportion of the industries in which dust may be a danger to health, but in certain cases it was found that the vision of the worker was impeded by projecting portions of the respirator to an extent which might seriously affect his efficiency. A new design which it is believed will overcome this disadvantage, without diminishing the efficiency of the respirator, and which is also likely to be cheaper to manufacture than the previous type, is now being developed. It is hoped that the work will be completed during 1935.

Considerable progress has also been made with the work which, as stated last year, is being carried out with the financial and technical co-operation of the Association of British Chemical Manufacturers, on the detection in the atmosphere of small quantities of toxic gases, such as may occur in industrial processes. Methods for detecting a number of such gases have been developed and are now being tested under industrial conditions before being definitely specified. It is hoped shortly to commence work on the second part of this programme, which aims at the standardisation of performance tests for respirators for use in industry as a protection against such gases.

Acetic Acid in Japan

PLANS are being made to form a new chemical concern, capitalised at 500,000 yen, to manufacture acetic acid from carbide produced by the Showa Fertilizer Co. Japanese chemical trade papers have been concerned over a possible surplus of acetic acid if another company enters the field, as the domestic supply is said to be more than sufficient to meet the requirements of the country, and exports for the first nine months of 1934 reached 8,891 metric tons. Japanese production of synthetic acetic acid during 1932, the latest year for which figures are available, amounted to 4,459 metric tons valued at 1,955,700 yen.

Progress in Bleaching, Dyeing and Finishing

Manufacture of Viscose Rayon

AN interesting paper has recently been contributed by A. V. Pitter (" J. Soc. Dyers Col.," 1935, *51* 21) on the manufacture and properties of viscose rayon. Although much has been published on this subject during the past few years, Pitter has succeeded in bringing forward many new facts. Almost forty years ago (in 1896 to be precise) the world's output of rayon was 590 tons; to-day is is about 280,000 tons. Viscose rayon is by far the most important type of rayon now being manufactured.

The essential facts of the manufacturing process for viscose rayon are as follows: Wood pulp sheets are steeped for 1 to 2 hours at room temperature in 17 to 18 per cent. caustic soda, and then hydraulically pressed so that they are about three times their original weight. At this stage the cellulose of the wood pulp is in the form of alkali-cellulose, $C_6 H_9 O_4.O Na$. The pulp is now kneaded in a machine of the Werner-Pfleiderer type so as to form fluffy " crumbs," which are stored at room temperature and in contact with air for 2 to 3 days. Slight degradation of the alkali-cellulose takes place by oxidation and this is carried to a stage at which the product is suitably reactive in the next process in which the alkali-cellulose is converted into cellulose xanthate by churning it for about three hours at 24 to 27° C. with carbon bisulphide. The product is then dissolved in dilute caustic soda and the composition of the resulting viscose solution adjusted so that it contains 7 to 8 per cent. of cellulose and 6 to 7 per cent. of sodium hydroxide.

The Viscose Solution

Freshly prepared viscose solution is difficult to coagulate and if spun by the usual methods would give a weak yarn having but little lustre. The solution is therefore ripened by allowing it to stand for 2 to 4 days under controlled conditions until its coagulation and viscosity properties are just satisfactory. It is then spun through porcelain or platinum nozzles each of which is provided with a number of small holes about 0.1 mm. in diameter, the number being fixed by the number of filaments required in the yarn. The emerging filaments (50 metres per minute) from each nozzle are led into a Topham centrifugal pot rotating at about 5,000 revolutions per minute and are thereby twisted together to form a yarn, which after purification by de-sulphurisation and bleaching, is ready for weaving or knitting. During spinning, the filaments are drawn into the Topham pot at a rate somewhat faster than they emerge from the nozzles (the ratio between these velocities is usually about 3 to 2) so that it is continuously stretched. This gives it improved strength, and the strength can, in fact, be varied over 150 per cent. by merely altering this stretch.

Pitter makes no mention of the fact that cotton linters can be used instead of wood pulp and that in this manner a superior type of viscose rayon can be produced. This point has, however, been recently discussed by F. Ohl (" Silk and Rayon," 1935, *9*, 18). When cotton linters are used, the resulting rayon is considerably stronger and more extensible in both the wet and dry states and it also has a better white colour. Unfortunately, cotton linters are more expensive than wood pulp, but against this is the fact that the linters contain 10 per cent. more alpha-cellulose and its use allows considerable economy in the consumption of caustic soda for the steeping process. The following data is given with reference to rayon yarns similarly produced from wood pulp and cotton linters:—

Property.	Cotton linter rayon.	Wood pulp rayon.
Count	112 denier	112 denier.
Dry tensile strength	1.56 grams/denier	1.36 grams/denier.
Wet ditto	0.58	0.45
Dry extensibility	22.0 per cent.	19.3 per cent.
Wet ditto	31.1 per cent.	26.9 per cent.

Moisture Absorptive Properties of Fabrics

Interesting data concerning the behaviour of various types of aeronautical textile materials towards a humid atmosphere have recently been published by G. M. Kline (" Amer. Dyestuff Rep.," 1935, *24*, 4) and the facts given are of considerable importance for quite large quantities of fabric are employed in covering aeroplanes and airships. It may be noted that in the United States dirigible "Macon" there were 32,000 square yards of fabric which weighed about 6 tons. In the ill-fated British airship " R.101 " which crashed on its first flight there was nearly 7½ tons of fabric.

Four groups of textile fabric are used for airships: Fabrics coated with cellulose nitrate dope, fabrics coated with cellulose acetate dope, uncoated cloths, and gas-cell fabrics. The last named consist of cotton balloon cloth weighing from 2.8 to 4.2 ounces per square yard and coated with a mixture of gelatine and rubber latex containing a polyglycerol as plasticiser. Fabrics coated with cellulose nitrate dope are least hygroscopic and in a saturated humid atmosphere take up less than 12 per cent. of moisture. Fabrics coated with cellulose acetate dope behave similarly in atmospheres up to 97 per cent. relative humidity, but at 100 per cent. humidity they absorb moisture rapidly and finally take up 30 to 35 per cent. of moisture. Uncoated fabrics, whether mercerised or unmercerised, take up about 20 per cent. of moisture, whilst the gas-cell fabrics are the most moisture absorbent and may take up 100 per cent., this being due to the hygroscopic properties of the gelatine and glycerol present in them. It is customary to coat gas-cell fabrics with a film of paraffin to retard the absorption of moisture; this treatment is effective as is indicated from the fact that the moisture absorption of samples of fabric with and without paraffin coating were found to be 52 and 71 per cent. respectively.

On aeroplanes, fabric coated with the inflammable cellulose nitrate dope is commonly used. It is found that when a cellulose acetate dope is employed the fabric loses some of its tautness in humid weather and particularly under conditions of fog. It is believed, however, that in order to minimise fire risks, cellulose acetate is the only type of dope used on service planes in France.

New Indigosol Dye

During the past two years the number of Indigosol dyes available has been steadily increased so that now practically any shade may be produced with this particular range of water-soluble vat dyes. G. Rudolph (" Kunstseide," 1935, *17*, 17) has now noted the appearance of a new grey member—Indigosol IBL—which is suitable for the production of dyeings of indanthrene fastness. Indigosol IBL is useful for application to cotton and real and artificial silks particularly; both dyeing and padding methods of application can be used. Development of the dye on cotton is most conveniently obtained by treatment with sulphuric acid and sodium nitrite, but on real silk an acidified bichromate liquor is recommended for this purpose. The solubility of the dye is good. Rudolph gives full details of dyeing methods and indicates (with attached patterns) compound shades which can be obtained in admixture with other indigosol dyes.

Resistance of Wool to Bacterial Attack

Some few months ago R. Burgess (" J. Text. Inst.," 1934, *25*, 289T) described a method by which the susceptibility of wool to attack by bacteria could be determined without actually using a bacterial culture. It depended on the discovery that a suitably buffered solution of trypsin or pepsin acts on wool in much the same manner as bacteria, except that it is more rapid. The technique suggested is as follows: The wool (about 0.1 gram) is freed from natural or added grease, wetted with water and then immersed in a mixture of 5 c.c. of (a) trypsin 0.5 gram, distilled water 100 c.c. and (b) 0.10 M. potassium dihydrogen phosphate 34 c.c., 0.05 M. borax 66 c.c. (buffered to pH = 8.6). Two drops of toluol are added and the tube corked and incubated at 35 to 40 C. In the early stages of incubation, microscopical observations of the epithelial scales of the wool fibres are made at hourly intervals and thereafter at longer periods. In this manner, breakdown of the wool fibres can be followed progressively. As the attack proceeds, the epithelial scales loosen and then become detached whilst the fusiform cortical cells separate and the fibres become thinner.

More recently, Burgess (" J. Text. Inst.," 1934, *25*, 391T) has recorded the results of his examination of a number of

treated and untreated wool materials by the trypsin test. Firstly, it was noticed that a considerable number of wool samples dyed with chrome dyes had good resistance to attack, and subsequently it was shown that treatment of wool with a hot chrome-sulphuric acid bath made it resist trypsin attack quite well. It will be remembered that a product—Eulan N—is available for mothproofing wool and that this substance is known to make wool somewhat more resistant to bacterial attack. Burgess has compared the effects of Eulan N with chrome and finds that the chrome and acid treatment gives wool the greater resistance to attack. At the same time, however, it was found that the protective influence of the chrome and acid is much enhanced when Eulan N is applied to the wool simultaneously.

Good resistance to bacterial attack is conferred on wool by treating it with a mixture of cutch with copper sulphate or potassium bichromate. Formaldehyde treatment has only a small protective effect. Using the trypsin technique, Burgess is continuing the investigations with a view to discovering a treatment of wool which, whilst giving this fibre excellent resistance to bacteria, will have no adverse effect on the properties of the wool itself.

The De-Sizing of Silk and Cotton

Diastatic Hydrolysis of Glue and Gelatine

In the de-sizing of silks and cottons, bacterial diastases, while working most efficiently at their own characteristic optimum of temperature and reaction, are less detrimentally affected than malt and pancreatic enzymes by deviations from it, said Mr. J. E. Evans, B.Sc., in a paper read before the Bradford Junior Branch of the Society of Dyers and Colourists on February 4.

The best temperature for de-sizing with rapidase is 160-165° F. This enzyme, like malt diastase, works most efficiently in a medium which is neutral or just on the acid side, say, *p*H 6.5, but again, like malt, the bacterial diastase can still de-size efficiently in a comparatively quite acid liquor. Unlike malt, however, bacterial diastase has the advantage of being active on the alkaline side also, up to about *p*H 8.5. While malt and pancreatic enzymes are quickly destroyed if heated much above their optimum temperatures, the bacterial diastase will resist heating to over 195° F., especially in presence of starchy material. On the other hand, lower temperatures than the optimum can be employed with bacterial diastases where colours, conditions of work, or the cloth demand it. These enzymes will de-size quite well, for example, at 140° F. The greatest margin of safety for practical working thus appears to be with the bacterial de-sizing agents.

Continuous Process with Rapidase

While all three types of enzymes –malt, pancreatic and bacterial diastases—are used satisfactorily for the usual non-continuous methods of de-sizing, the higher working temperature of bacterial diastases and the almost instantaneous liquefaction of starch obtained at such temperatures has rendered it possible to apply rapidase for de-sizing cloth in a way previously impossible. By using any machine affording a rapid passage of the cloth through three or more compartments, conversion of the starch and washing-off the liquefied size are effected continuously in one passage. The essentials are to pass the fabric through a bath of hot water to wet it properly, to burst the starch and to wash away mineral salts, and then pass it through a bath of the diastase maintained at 75° C. Without pause, the cloth is finally run through one or two washing compartments containing boiling water to remove the liquefied (and partially solubilised) starch and size. De-sizing is then complete.

From the practical point of view, almost as important as de-sizing is the wash-off which follows. This should be as thorough as possible, with boiling water, or at any rate as hot as the cloth and colours will stand, so as to remove the size which has been liquefied in the enzyme bath, but which is still on the cloth.

Many bleachers and dyers believe that boiling with alkali will bring about de-sizing, either wholly or partially. If this is done it will be found that after several hours of boiling with strong soda ash, or even with caustic soda, all the starch is left in the cloth. Only a long treatment under pressure can dissolve the size, but the weft is then submitted to the action of the alkali for so much longer than the warp, which is protected for a time by the size and this is not conducive to a uniform white. All such alkaline treatments are excellent for the fatty matters, but have really no effect on the starchy materials which constitute about 90 per cent. of the impurities to be removed.

The need for a de-sizing agent of a different type has arisen recently with the widespread employment of gelatine sizes for artificial silk yarns. It is not always possible to remove these sizes by washing with water alone, and considerable trouble can arise in later processes from their presence. Uneven dyeings, and a boardy handle, are caused in such cases. However, an enzyme de-sizing agent prepared in powder form specially for the removal of gelatine sizes has been used in the trade during the last year or two. The trade name of this enzyme is gelatase.

As gelatase is a bacterial enzyme it is quite resistant against variations in working conditions. Its optimum is 130° F., and it works well up to 140° F. A slightly alkaline bath (*p*H 7-7.5) is most suitable, but the range of activity extends from *p*H 6.0 to 8.5 or 9.0, giving ample margin on both sides of the neutral point.

De-Gumming Real Silk

A problem presenting itself sometimes to real silk manufacturers is how to de-gum real silk in a mixture fabric without tendering or delustring acetate or other artificial silk in the fabric, or in other cases, when treating a mixed fabric of silk and wool how to de-gum the silk without felting the wool. Here, the enzyme gelatase is of great assistance, since it has a certain solubilising action on the silk gum. The cloth is first passed through hot water at 160-180° F. until wet out to swell the raw silk gum. The enzyme bath (1 gallon per 10 lb. of cloth) is prepared at 130° F. and the de-gumming treatment is carried out on a jig or winch machine for 3 hours. The solubilised gum is removed by washing well for 10-20 minutes in hot water of at least 180° F. Finally, to complete the removal of all traces of gum, the fabric may be lightly soaped for half an hour at about 160° F. with 5 to 10 lb. soap per 100 gallons. This is not necessary, however, when the preliminary wetting out can be done at the boil.

Diastatic Hydrolysis of Glues

The application of gelatase for the treatment of ordinary glue for cloth finishing is novel. Glues and gelatines have many advantages as sizing materials, brilliancy, clarity of solutions, and their power of swelling or filling the fabric, while the finished cloth does not mark or dust and the most delicate colours are never impaired. Conversely, defects particular to raw glues are those of poor penetration into heavy goods, the difficulty of using strong solutions and especially in the boardiness of the finished cloth.

The diastatic hydrolysis of glues and gelatines is made in the following manner: Make a solution of glue in water, 30, 40 or 50 per cent.; neutralise with soda and maintain the solution at 130° F. Add gelatase and leave the solution to cool off slowly overnight after keeping it at 130° F. for about an hour. The hydrolysis of glue by gelatase follows the same laws as that of starch by rapidase, but, up to the present, gelatase is the only product which can bring about the limited liquefaction of glues, without the wasteful formation of valueless amino acids and lower degradation products. These liquefied glues are simple to prepare, but, if preferred, finishers will shortly be able to obtain them ready for use.

This liquefied glue has a total lack of stickiness (in the ordinary sense), no tendency to set as ordinary glue solutions do on cooling and excellent penetration into any fabric, to which thickness and fullness is given without harshness.

Works Councils in Modern Industry

Their Value in Solving Social Problems

FOR what reason is a works council formed; what is its constitution and how does it function? Mr. R. L. Rait, of Imperial Chemical Industries, Ltd., answered these questions in a paper on "Works Councils," which he read at a meeting of the Junior Branch of the Institute of Industrial Administration on January 30. Before the days of rationalisation, he said, the works manager knew personally every man or woman in his factory. With the advent of combines his factory was amalgamated with others, and, in due course, we will assume that it was closed down because there was another place in the company where the manufacture could be carried out more efficiently and more economically. Eventually, there exists a number of works with much increased personnel. Numerically it is impossible under the new conditions for the works manager to know more than a minority of the men.

It is true that one may find in these larger factories a labour manager or welfare supervisor, whose job is to act as liaison officer between the management and the employees, but, although the workpeople can go to him and get help and advice, it is difficult for them to get to know the managing director, and in many cases the men in the works do not know the works manager even by sight. There is thus a serious lack of contact between management and employees. Concurrently with this situation it has become more and more the accepted principle that the care of employees is just as important as the interests of the shareholders, and once you have accepted that principle it is a natural corollary that the employee should have a voice in the running of the factory, and, although few people expect him to assume managerial functions, there are many subjects connected with the general wellbeing of the employees at the factory which can be discussed to the mutual benefit both of the workpeople and of the management. The works council is probably the best means of accomplishing this end.

Size of the Council

A works council, generally speaking, is made up equally of representatives from the management (including foremen) and representatives from the workpeople. The size of council varies according to the personnel of the factory, ranging from eight members in a factory with fewer than 250 employees to 24 members in a works with over 2,000 employees. For a works with, say, 8,000 employees it has been found preferable to have as many as four councils, as a factory of that size should readily be capable of sub-division. The management nominates its representatives to the council and, as far as possible, half of the seats available should be allocated to foremen and forewomen. The employees elect their own representatives by ballot. In Imperial Chemical Industries, Ltd., there are three types of council—the works council, the group council and the central council.

A works council is primarily a consultative body, advisory to the management. It is not concerned directly with the problems and conditions relating to an industry, but is chiefly concerned with the particular works of which it is representative and is therefore not competent to discuss a matter which is the subject of an operative agreement between the company and any trades union.

Works councillors have, in the experience of Imperial Chemical Industries, Ltd., given most enthusiastic support to the management on questions of safety. By propaganda and example to their fellow workers they have brought about an atmosphere of safety-mindedness which it is otherwise quite impossible to produce by the display of regulations and posters. A large field has been covered by the sub-committees of the councils which have dealt with this question.

It is customary for the chairman of the council, who, by the way, is usually the works manager, to tell the council the trade position month by month. This will include a comparison of the orders received with a previous period, a review of each of the units in the factory with comments on the progress achieved and an estimate of the position during the coming month. Should it become necessary to work short time or to suspend employees in consequence of trade depression the council is informed of this beforehand and its advice is sought as to the manner in which this can best be carried out to avoid undue hardship. Members of the council appreciate that they have the confidence of the management in these matters, and by the interchange of ideas there arises an atmosphere of understanding which it is impossible to get by any other means in a large works.

The election of the workers' representatives should be held annually on general election lines, including provision of works notices, voting papers, ballot boxes and neutral scrutineers, etc. A candidate should have a service qualification with the company of from three to five years, otherwise the man may not know the actual conditions of the section of the works for which he is standing. The register of voters should include, for the same reason, only those employees who have been in the service of the company for a whole year.

The Ideal Period of Office

There is divergence of opinion as to the period during which members should remain in office. On the one hand it is argued that representatives generally require some little time to become acclimatised to their work, and that it takes a year before they settle down. On the other hand it is pointed out that one of the chief functions of the council is an educative one, and therefore the principle of annual retirement gives to an increasing number of members an opportunity to widen their outlook.

Regularity of meetings is essential. The workers' representatives who attend the councils should do so half in their own time and half in that of the firm, and for the latter period they should be paid at the same rate as if they had been still working. The meetings are best held in the works manager's office, in the board room, or in some other place where members feel that they have some standing as a meeting. As a matter of convenience, meetings are usually held at monthly intervals unless pressure of business or urgency calls for more frequent meetings. The choice of chairman is important as the usefulness of the council depends largely on whether he is sufficiently sympathetic and patient; he must not rush through the agenda or appear too formal. Care should also be taken to avoid any suggestion of "sides" in the council by intermingling of the management and of the workers' representatives round the table.

The existence of works councils makes an admirable medium through which people can co-operate to solve the many social problems with which modern industry is faced. The success or failure of that wider aspect of scientific management which we call rationalisation will depend fundamentally on the degree to which sympathy and practical consideration is given to the human factor. Works councils have come to stay, and will form an important part in those industries where rationalisation is going to reap the success which it undoubtedly deserves.

The Other Man's Point of View

A number of points were put to Mr. Rait during the discussion. He stated that there are a number of firms in this country who operate works councils, and, generally speaking, these schemes are found among the larger concerns rather than the smaller. The variety of suggestions which come before councils is wide, and, although it is not possible to give statistics as to the percentage of recommendations from councils which are afterwards put into operation by the management, it is true to say that the occasions on which the management finds itself obliged to turn down a recommendation are the exception rather than the rule. Although a works council is primarily a consultative body, it also exercises executive powers, such, for instance, as the administration of benevolent funds, and of certain matters of discipline. In the absence of any special factors, the management has often been guided by the recommendations of the council on such questions as the most equitable manner, from the men's point of view, of operating short-time working, suspensions owing to trade depression, and rotation of shifts. Works councils had proved a most useful medium for introducing the "other man's point of view." An extremist soon modified his attitude to life as the result of the co-operative atmosphere under which the work of the council was carried out.

Growing Importance of the Rubber Industry

Factory or University as Training Ground

THE growing importance of the rubber industry in Scotland was emphasised by Mr. D. D. McLachlan, of the India Tyre and Rubber Company, Ltd., who was one of the principal speakers at the annual dinner of the Institution of the Rubber Industry (Scottish Section), held on February 8 in the Grand Hotel, Glasgow. Mr. McLachlan, proposing the toast of "The Institution of the Rubber Industry," said that while the present age was undoubtedly the electrical age, we were also on the eve of the rubber age. The popularising of rubber goods sprang not from the necessity to use the enormous supplies now available, but from the fact that the new latex articles would be for the benefit of humanity. He pointed out that tyre companies, one and all, were doing their utmost by means of construction and design to help in reducing road dangers.

With regard to Scotland's share of the industry, he said that of the 100,000 tons of rubber imported into Britain last year, Scottish manufacturers used 10,000 tons, or 10 per cent. of the total. This material was used in the making of Scottish rubber products which had great acceptance throughout the Empire and the world, these including cables, coated fabrics, raincoats, footwear, sponge rubber, golf balls, rubber paving for streets, tyres, inner tubes, tyre repair materials, hospital and druggists' supplies, and innumerable household fittings.

Mr. F. D. Ascoli, president of the Institution, in responding to the toast, referred to the work that was being carried on by the council on behalf of the Institution. Efforts were at present being made, he said, to obtain a Royal charter, which was a matter of great importance not only for the Institution but for the industry as a whole, and he hoped they would be successful in their efforts to obtain it.

The Better Training Ground

A discussion on the question as to whether the factory is a better training ground than the university was opened by Mr. A. T. Roberson, of the Works Superintendents' Department, Dunlop Rubber Co., Ltd., at a meeting of the Midland Section of the Institution of the Rubber Industry on February 7. He said he had come to the conclusion that men who obtain their experience in the factory, commencing at a fairly youthful age, have the advantage over their university brothers. University life was no doubt excellent from the viewpoint of having a good time, with the leisure to develop the sporting instincts to the full—during working hours as it were—but what a shock a man must get when he leaves the university to enter industry at age 21, or over, and finds that he has to compete with men of his age who have had four or five years start on a job where he has to earn his living. The university can undoubtedly produce chemists and research workers, and there is room for these specialists in most branches of industry to-day, but their training has been along certain well-defined logical lines, and it is extremely difficult for them to accommodate themselves to the practical side, and they do not readily do so. They have been trained as scientists and are not informed on factory problems of planning, labour management, etc.

The argument against a university training for an industrial occupation is that it occupies the years between 18 and 23, which are the most receptive years. It might be argued that the university man has the more trained mind; on the other hand, the boy of 17 can easily remedy this by attendance at evening and part-time day classes. As proof of this Mr. Roberson spoke of the numerous great men in all walks of life who were not university trained, and many not even with secondary school education. The university man has, at the age of 21 or over, passed the stage when he wants to start learning a job. He wants and expects to get a job of responsibility immediately he enters the factory, and he is obviously totally unfitted.

Personally, Mr. Roberson felt that theoretical education is carried on too long, and certainly not on lines that fit in with modern factory practice. He held the view of many that universities should endeavour to cater, not only for the specialist, but for those who require an education on broader and more general lines. With this in view, industry and the university must co-operate and provide the facilities for training, which have their counterpart in modern factory practice. If this is done, then the university men will need a little less factory period before they are of some value to industry. There is, he added, an increasing tendency on the part of university students to get practical experience in factories during their usually long vacations. Whether this is due to an urge on the part of the university governors, or the desire of the students, he was not sure, but, in any case, it is a healthy sign.

Mr. Roberson favoured the secondary or grammar school boy who enters industry at age 17 or 18. He said the factory can select boys of this age who have done reasonably well at school and are likely to show promise. These youths should spend definite periods in the various departments, workshop and office, while continuing their studies during evenings at institute or technical college, and, where possible, day classes during working hours. Encouragement should be given to those who show special merit, and advanced courses arranged. This combination of hard practical training, in conjunction with studies of the subjects bearing a direct relation to the work, is far in advance of any university course, and is where the average young man scores over the university student.

London Section : Rubber in the Gas Industry

Rubber in the gas industry was discussed by Mr. C. R. Austen, of the Gas Light and Coke Co., before the London and District Section of the Institution of the Rubber Industry on February 11. Closer co-operation between the rubber and gas industries was urged by Mr. Austen. The special requirements of the gas industry should be more fully known and understood, he said, as future advances in gas design and technique will inevitably increase the demand for rubber.

Rubber joints are already finding increasing favour, but complete confidence in them has not yet been established in this country, and the provision of national standards of quality and performance for rubber jointing materials would greatly enhance their reputation. In the utilisation of gas, the most important uses for rubber are for geyser diaphragms and flexible tubes for the conveyance of gas. Diaphragms in general are satisfactory, but flexible tubes, he declared, while being satisfactory in other respects, smell unpleasantly after a short period of use. The smell can be traced to the migration of the gas through the rubber, and, although considerable attention has been paid to this subject, there remains a real and urgent need for a gas-resisting rubber tube.

Royal Society of Arts

Thomas Gray Memorial Trust

UNDER the will of the late Thomas L. Gray, the Royal Society of Arts has been appointed residuary legatee of his estate for the purpose of founding a memorial to his father, the late Thomas Gray, C.B., who was for many years Assistant Secretary to the Board of Trade (Marine Department). The objects of the trust are "The advancement of the Science of Navigation and the Scientific and Educational interests of the British Mercantile Marine."

The council now offers (i) a prize of £100 to any person who may bring to its notice an invention which, in the opinion of the judges is considered to be an advancement in navigation, proposed or invented by himself in the period January 1, 1930, to December 31, 1935, (ii) a prize of £100 for an essay on Modern Navigational Appliances. 1. Appliances made possible by electricity on board, *e.g.*, wireless D.F., echo sounding, gyroscope, etc. 2. Appliances not depending on electricity, *e.g.*, range finding, sounding machine, compass, etc. Competitors must send in their essays not later than December 31, 1935, to the Secretary, Royal Society of Arts. Both competitions are open to persons of any nationality, but, in the case of the essay competition only, competitors must be past or present members of the seafaring profession. The council also reserves an option on the copyright of the successful essay or essays, but does not claim any rights in respect of any invention to which a prize may be awarded.

The Functions of a Research Department

Points from a Paper by Mr. T. M. Herbert

THE ultimate object of a research department is to assist in increasing the net revenue of the company in relation to its capital outlay, said Mr. T. M. Herbert, of the L.M.S. Railway Research Department, in a paper read before the Institute of Fuel, on February 13. In the case of a railway company, it may achieve this result either directly, by pointing the way to savings in operating or maintenance costs, or indirectly, by assisting in the development of better services to the public or in helping to avoid irregularities and failures in service.

To play its part in attaining these objectives the research department should: (1) discover and define problems in which scientific research can assist; (2) provide means, either internally or externally, for carrying out such scientific research; (3) act as scientific consultants to all departments; and (4) keep the departments in touch with scientific developments relevant to their activities. It will, therefore, be noted that the work of a research department in an established industry is essentially of an advisory nature, whereas in many of the newer industries, *e.g.*, the electrical industries, it is largely in the research department that the ultimate products of the industry are born.

Well Defined Stages

Most industrial research problems can now be attacked without the fear of serious difficulties of method and technique. In almost every piece of industrial research, whether concerned with the development of some new material or process, or with the cause of some defect or trouble, there is a series of well-defined stages. First, there is the isolation or selection of the problem to be studied; secondly, the exact definition of the selected problem and the collection of any outside data bearing on the subject; thirdly, there is the laboratory stage proper, from which it is hoped that sooner or later certain suggestions will emerge; fourthly, there is the demonstration stage of full-scale trial; and lastly, there is the application stage when the results are applied in general practice.

The selection of subjects for research, particularly of major problems, is not a simple or automatic process. In any industry, factory, or department, there will exist, it is true, a number of unsolved difficulties, but these do not always emerge readily as soon as a research department is formed.

A problem selected is not necessarily a problem defined. The definition of a problem requires close co-operation between the patient and the doctor, and it does not always happen that the patient is good at diagnosing his own symptoms. The research department must be allowed to form its own judgment on the evidence submitted to it, and in order to effect a scientific analysis of the problem, the research department must set itself out to become a specialist in the technique of measurement.

Close Contact with Organisations

The stage now arrives at which it should be possible to see what experimental work is required, but, before putting this in train, it is most desirable to make sure that similar work has not been carried out previously in some outside institution. A survey of the literature of the subject is required, and this process, unaided, may be a lengthy one. Close contact with organisations can be of considerable value. They almost invariably maintain an efficient library and information service and are usually prepared to undertake the preparation of a short bibliography for inquirers. In the absence of facilities of this nature, the work will have to be done *ab initio* by the research staff in libraries such as the Patent Office Library in London.

With regard to the actual conduct of laboratory work, a decision must first of all be reached as to whether this should be done in the firm's own laboratories or at some outside institution. In the case of a railway company, with its wide range of interests, there is ample scope for both methods; in the case of a smaller firm dealing with a less diversified range of subjects, there is much to be said for doing most of the work internally. The advantages of doing the laboratory work oneself are that (i) the research staff is usually conversant with some of the practical aspects of the problem; (ii) there is closer control, which enables a promising result to be quickly appreciated; (iii) the cost is often less, provided reasonable laboratory facilities are available, and unless some unusually expensive apparatus or highly specialised technique is needed.

The extent of the facilities for obtaining information and advice, and for having investigations carried out, is much greater than is often appreciated. First, there is the Department of Scientific and Industrial Research, and the various research stations and boards associated with it, dealing with physics, chemistry, fuel, building, timber, food, illumination and a variety of other subjects. This organisation has been developed with the specific object of helping industry, and it can and should be regarded by all industrial research departments as part of their common assets.

Wherever conducted, most researches will sooner or later reach a stage when suggestions for practical trial can be made. A common mistake is to transfer laboratory results to the trial stage too soon, and it is very essential to be reasonably sure that a suggestion is really promising before requesting that a trial should be allowed. Naturally, only a proportion of such trials will be even moderately successful, but a flood of immature suggestions quickly discredits both the scientific ability and the practical common-sense of the research staff.

The formation of a research department in an existing industry involves both an innovation in function and an experiment in organisation. New facilities are provided for existing departments by the formation of an independent scientific service, but proof of the soundness of this step can be found only in the results yielded by it.

Canadian Metal Production

Mineral Exports Rivalling Agricultural Products

CANADA'S silver production in 1934 totalled 16,350,029 fine ounces, valued at $7,764,000, an increase of 8 per cent. in quantity and 35 per cent. in value as compared with 1933 output of 15,187,950 fine ounces ($5,746,027). Last year's copper output, amounting to 367,054,472 lb., was a record figure for the Dominion, exceeding the total for 1930 by 21 per cent., whilst the output of copper in 1933 reached only 299,982,448 lb. valued at $21,634,853, as compared with $26,881,000 representing the value of the 1934 production. The previous record production of 1930 was valued, however, at $37,948,359. Nickel output, consisting of refined nickel, nickel in nickel oxides sold and in matte exported, totalled last year 130,346,400 lb. valued at $30,674,000, as against 83,264,658 lb. ($20,130,480) in 1933. Last year's output was therefore higher than that of 1933 by 56 per cent., and by 18 per cent. as compared with the previous record year, 1929. Lead production in Canada in 1934 is estimated at 342,811,000 lb., valued at $8,357,000, an increase of 29 per cent. over the 1933 total of 266,475,191 lb. ($6,372,998). Zinc production rose by 51 per cent. during the year from 199,131,984 lb. ($6,393,132) to 300,747,113 lb. ($9,169,000), being 12 per cent. greater than the total reported in 1930, the previous record year.

The importance of the non-ferrous smelting and refining industry in Canada continues to increase, the value of plant products reported for 1933 being $100,561,297, as against $76,442,076 in the previous year. Exports of these metals have grown as well during the year from $48,130,177 to $69,340,625, while during the year 1933 a total of 469 Canadian factories manufacturing non-ferrous metal products had a production valued at $167,105,027. The Hon. W. A. Gordon, Minister of Mines, of the Dominion of Canada, in an article contributed to the "Montreal Gazette" recently, shows that the development of the mining industry in recent years has brought mineral exports to a position rivalling in importance those of agricultural products and exceeding in value those of the forest industry.

Notes and Reports from the Societies

Society of Public Analysts

Dermatitis, Inks and Cod Liver Oil

AN ordinary meeting of the Society of Public Analysts was held at the Chemical Society's Rooms, Burlington House, on February 6, Mr. John Evans, president, being in the chair. Certificates were read in favour of A. E. Andrews, W. L. Davies, G. W. Ferguson, O. Hitchen, J. Knaggs, and N. Ratcliffe. The following were elected members of the Society: H. Dryerre, R. W. Hoff, L. J. S. Lane, and A. E. Wright.

In a paper on "The Chemical Examination of Furs in Relation to Dermatitis. Part V. The Action of Acid on Bandrowski's Base," by Dr. H. E. Cox and Mr. J. U. Lewin, it was stated that a study has been made of the decomposition of Bandrowski's base by boiling it with dilute hydrochloric acid. The intermediate product has a strong violet-red colour resembling logwood extract and is probably an unstable quinonediimide dihydrochloride. The final products are para-phenylenediamine and a black quinoid compound, $C_{12}H_{10}N_2O_2$ (for which a structural formula was given), together with small amounts of carbon dioxide and hydrogen cyanide. The mechanism of the reactions was discussed. Notes were given of the analytical reactions by which the red products of decomposition of Bandrowski's base and its analogues prepared from di-methyl-*p*-phenylenediamine may be detected in the presence of logwood—a problem which arises in logwood-dyed furs which have been topped by means of a diamine.

Dr. C. Ainsworth Mitchell, in a paper on "The Use of Infra-Red Rays for Distinguishing between Inks and Pigments," showed that Plotnikow's discovery of the phenomena of longitudinal expansion and reflex scattering of the rays affords an explanation of the remarkable results obtained by infra-red photography, such as the deciphering of documents in a closed envelope and the revealing of obliterated writing. The degree of transparency of blue-black inks to the rays depends, in part, upon the relative proportions of black pigment and blue dye. Some red pigments, such as vermilion and red ochre, are transparent; others, including Indian red, are opaque. Of blue pigments, Prussian blue is opaque, cobalt blue and aniline blues are transparent, and ultramarine is fairly transparent. The method thus enables certain printing inks and coloured pencil pigments to be distinguished from one another. Sepia from the common cuttle fish is relatively opaque, and in this connection it is shown that the reflex scattering of rays by the skin of a negro (which appears white in an infra-red photograph) is much more pronounced than the scattering from the skins of aquatic animals. Thus, the pigmented stripes on the skin of a mackerel have their normal dark appearance in an infra-red photograph.

Mr. R. S. Morgan and Mr. H. Pritchard, in a paper on "Vitamin Potency and Associated Characteristics of Cod-Liver Oil," showed that the vitamin potencies of an average sample of cod-liver oil, prepared by mixing together equal quantities of 64 samples of medicinal oil purchased retail from pharmacies in different parts of the British Isles were determined as 670 international units of vitamin A and 81 international units of vitamin D per gram. These assays were based on the results obtained with 40 pairs of rats in each assay. The characteristics associated with vitamin A of the average oil were as follows: Blue value, 9.3; blue value via unsaponifiable matter, 21.8; extinction coefficient at 328 mμ (1 per cent. solution in a 1 cm. cell) via unsaponifiable matter, 0.505.

Society of Chemical Industry

A Conference on Meat

ARRANGEMENTS have been completed by the Food Group and Liverpool Section of the Society of Chemical Industry for a symposium on "Meat" to be held in the Chemical Department of Liverpool University on March 8. Many scientists from all parts of the country are to attend the conference, which will be divided into an afternoon session covering "The Chemistry of Meat" and an evening session dealing with "Meat Storage." The principle papers are: afternoon session, "The Proteins of Meat," by Dr. E. C. Smith, of the Low Temperature Research Station, Cambridge; "The Constituents of Meat Acting as Pointers of Change," by Mr. L. C. Baker, of J. Lyons and Co's research laboratories. Evening session, "Post-Mortem and Refrigeration Changes in Meat," by Dr. T. Moran, of the Low Temperature Research Station, Cambridge. "The Storage and Conditioning of Fresh Meat," by Mr. Hal Williams.

Road Research: Criticism of Rule of Lowest Tender

DR. R. E. STRADLING, director of Road Research of the Department of Scientific and Industrial Research, read a paper before the Road and Building Materials Group of the Society of Chemical Industry, on February 13, which gave an account of some of the work being carried out at the Road Research Laboratory. The author dealt with the subject of road science under the following main headings: (1) Road requirements; (2) factors affecting the road; (3) properties of road materials, and (4) design and construction of roads. "The *art* of road engineering," said Dr. Stradling, "occupies a far greater proportion of the field of practice than it should do in these modern times, and one of the most difficult sides of our work is the attempt to understand and express scientifically the empirical working rules of the art of road construction."

According to the Ministry of Transport figures only about 4 per cent. of street accidents could be traced to actual road conditions, and that was much to the credit of road engineers and the Ministry of Transport. It might be that the financial cost was high, but by road research there was little doubt that cheaper methods would be worked out. On the subject of road construction Dr. Stradling uttered a word of criticism of the rule of accepting the lowest tender. He said it might strike the purely financial mind as a simple working rule to prevent favoritism and promote efficiency, but he felt that a high percentage of road troubles resulted from this procedure, and probably nearly all the bills for extras and variations.

Work in hand was being pushed forward as fast as possible with the staff available to produce the information which would lead to more exact specification of materials. Also the work on methods of road measurement should provide instrumental means of specifying finishing limits to road surfaces in addition to providing valuable aid to engineers in indicating when repairs were necessary. With bituminous materials the knowledge which would thus become available for specification purposes of materials and finishing limits together with compaction details, would probably provide the chief items necessary to the designer of such roads. For concrete work knowledge was also required as to the strength requirements of road slabs and this was receiving detailed study.

Dr. Stradling concluded with a call for sympathetic co-operation between the practitioner and the scientific worker. "It is," he said, "an urgent necessity if progress, which matters, is to be made in any reasonable time. Will you give us your friendly and constructive criticism and the results of your own practical experience whether it be road construction, manufacture of materials or laboratory work? We are a young organisation and we are anxious to be of the maximum service to the industry at the earliest possible moment. We hope you will visit the laboratory—not as sight-seers but for serious discussion."

Oil Burner Manufacturers

Annual General Meeting

THE first annual general meeting of the British Oil Burner Manufacturers Association, which was preceded by a luncheon, was held at the Connaught Rooms on February 14, when Mr. F. H. Horton, of G. N. Haden and Sons, Ltd., presided. Members of the council present were Mr. F. L. Bolt (Wallsend Slipway and Engineering Co., Ltd.), Mr. R. L. Nash (Clyde Oil Fuel System, Ltd.), Mr. W. A. Hubbard (Combustions, Ltd.), Mr. R. Sutton (Urquhart's (1926), Ltd.), and Mr. A. J. H. Binns (Parker, Winder and Achurch, Ltd.). In addition, the following ordinary members were represented: G. C. Pillinger and Co., Ltd., Filma Burners, Ltd., Swinney Bros., Ltd., and White's Engineering Co. (Pendleton), Ltd., and associate members: The Globe

Tank and Foundry (Wolverhampton), Ltd., The Beeston Boiler Co., Ltd., Ideal Boilers and Radiators, Ltd., The Rheostatic Co., Ltd., and Crane, Ltd.

Mr. F. H. HORTON, in dealing with the activities of the Association, referred to the fact that a great deal of time had been devoted to the consideration of a specification for minimum standards of design, manufacture and installation of automatic oil-burning plants (domestic and central heating.) Considerable progress had been made as a result of informal discussion which had taken place with certain interested authorities. Before long it should be possible to issue the specification, which should be of much value to the industry.

Mr. Horton was re-elected president for the ensuing year, whilst Messrs. F. L. Bolt, R. L. Nash and W. A. Hubbard were re-elected vice-presidents and hon. secretary respectively. Com. A. Marsden, of Filma Burners, Ltd., was elected to a seat on the council.

Chemical Society

Liverpool Section : Long-Chain Compounds

RESEARCHES on long-chain compounds, the subject of a lecture delivered to the Liverpool Section of the Chemical Society on February 1. The lecturer was Dr. J. C. Smith, of the Dyson Perrins Laboratory, Oxford. Professor A. Robertson was in the chair.

During the purification of cetyl (hexadecyl) alcohol, said Dr. Smith, it became evident that few of the higher aliphatic compounds had been obtained free from homologues. An extreme example of the behaviour of these substances was that of mixtures of hexadecyl and octadecyl alcohols. Mixtures containing from 0 to 30 per cent. of octadecyl alcohol all melted within one degree of the melting point of pure hexadecyl alcohol. This was owing to the formation of a continuous series of solid solutions with a minimum melting-point at approximately 15 per cent. of octadecyl alcohol. Similar studies of the more important derivatives of hexa-, hepta- and octadecane showed the prevalence of polymorphism, for example, ethyl palmitate formed transparent crystals m.p. 19.3°, and opaque (β) crystals m.p. 24.18°. These investigations have been extended by Malkin and by Phillips and Mumford. It appeared that the transparent forms had the general direction of the carbon chain at right angles to the terminal planes of the crystal, and in these forms there was no "alternation" of melting-point. The opaque forms had "tilted" chains and the m.p.'s alternated. This was evidence in support of the theory of Tamman ("Z. Anorg. Chem.," 1920, *109*, 221), who ascribed alternation in m.p. to changes in crystalline form, but it seemed unlikely that any one theory would explain the whole range of alternation phenomena.

An attempt had been made to collect and interpret the results of the very large number of investigations on this subject, and a detailed discussion would shortly be published. Briefly, the reactivity of a homologous series of compounds with a given reagent fell into one of three classes: (a) There was a rapid fall in reactivity in passing from the first member (one CH_2 group) to the third member (three CH_2 groups) and then a slow decrease right along the series. Examples were the reactions between alkyl halides and trimethylamine, sodium phenoxide, sodium benzyloxide, sodium methoxide; the hydrolysis of esters and the esterification of alcohols. (b) There was an increase of reactivity with increase in the length of carbon chain. Only a few examples were known: the relative directing power of an alkyloxy-group (as shown by the nitration of p-alkyloxy anisoles), the rate of chlorination of o- and p- substituted alkyl ethers of phenol, and the rate of conversion of alkylamine acetates into amides all increased as the homologous series was ascended. (c) There were large alternations or fluctuations in reactivity with the first three or four members of the series, followed by a gradual decrease. In all these cases there was present some unsaturated atom or group, -CO-, -S- or phenyl. Examples were:

$CH_3 . CO . O(CH_2)_n Cl + KI$ (Conant).
$CH_3 . CO . (CH_2)_n . Cl + KI$ (Conant).
$C_6H_5 . S . (CH_2)_n . OH + H Br$ (Bennett and Mosses).
$R . CH_2 . CO NH_2 + H_2O$ (Crocker).

If the dissociated constants of n-aliphatic acids could be taken as a measure of their reactivity the acids fell into this class.

In thanking the lecturer, Professor T. P. Hilditch said he was hoping Dr. Smith would tell them something about the peroxide group on which he believed he had done a great deal of work. He would ask Dr. Smith, however, how one was to do a melting point when only 0.1 or 0.2 of a gram of material were available to work upon.

Replying, Dr. Smith said that in regard to m.p. with small quantities, he thought the most accurate method was that of Dr. Chidnorth.

Institute of Chemistry

Liverpool Section : Chemistry of Plant Reproduction

BEFORE the Liverpool and North-Western Section of the Institute of Chemistry at the Constitutional Club, Liverpool, on February 14, Dr. J. McLean Thompson, professor of botany at Liverpool University, gave a paper on "The Chemist and Plant Reproduction."

Professor Thompson said that among the aspects of growth demanding the attention of both biologists and chemists, perhaps the most outstanding was that involved in reproduction, of which the simple features were the affairs of the student of structure; but there were chemical complexities calling for physiological investigation. Important aspects of reproduction in flowering plants were the diversion from normal growth to form sterile or fertile organs, the protein content of these, and abnormal cell formation due to protein deficiency.

Several lantern slides were shown in the course of the address.

Huddersfield Section : The Work of the Railway Chemist

WORK which comes within reach of the chemist in the employ of a railway company was explained by Dr. P. Lewis-Dale, B.Sc., F.I.C., in a paper read before the Huddersfield Section of the Institute of Chemistry on February 13. He pointed out that the first railway chemist was appointed in 1864, before the periodic table was conceived and when benzene was without its familiar hexagonal formula.

Dr. Lewis-Dale first explained the "Railway Classification of Goods" to show why the chemist could help towards, and, indeed, was an essential factor, in the correct classification of many commodities. In really a surprising number of cases, the chemical composition of a commodity affected its classification, yet, of course, the classification was not based on chemical composition. The chemist's function was not to classify but to assist the commercial department to classify commodities correctly. Knowledge of what a substance is made of was useful only as a guide to what a substance is. He instanced cases where a simple chemical is called by a "fancy" proprietary name and sold at a very high price as compared with that of the chemical of which it is composed. The railway classification provided generic entries which applied in such cases. Many "patent" medicines were composed of single common chemicals or mixtures of two or more such chemicals. Their proper classification, of course, was "medicines," which, in the Railway Classification, is "drugs."

Perhaps the chemist's most intimate contact with carriage of goods was the devising of safety regulations and therefore goods with dangerous properties were of special interest. Dr. Lewis-Dale alluded to the regulations for carriage by railway of explosives, inflammable liquids, compressed and liquefied gases, dangerous corrosive and poisonous chemicals and miscellaneous substances with dangerous or objectionable properties. The regulations had been drawn up during the course of years on the recommendations of the chemists and were designed for and directed towards the safety of the travelling public and the railway staffs. They included measures for keeping away from foodstuffs many poisons and objectionable substances, thus protecting the public as a whole. He stressed the necessity for somewhat similar regulations to be applied to transport by road and cited the Report of the Chief Inspector of Explosives as evidence that the same view was held in official quarters. The railway companies were continually reviewing their regulations, and if any proved unnecessary, or too onerous, they were withdrawn or amended. On the other hand, the railways would not withdraw the conditions they thought necessary for safety in order to gain traffic, even though loss of traffic had resulted in some instances.

Later in the paper, Dr. Lewis-Dale described other phases

of chemists' work of exclusively railway interest. He referred to such subjects as chemical treatment of weed growth on the permanent way, in water troughs, etc., and to special oils and wicks for signal lamps and gave a detailed description of the requirements for, and the construction of, satisfactory fog signals. He stated that the steam locomotive was exclusively a railway machine, and referred to several interesting problems connected with it. The most important was that of combustion. Detailed experiments were now being carried out with a view of ascertaining more about the furnace efficiency of the steam locomotive under service conditions. In addition to the factors affecting combustion in a stationary installation, there were many others in a locomotive, chief among them being the necessarily limited size of the combustion chamber, the draught and its variation, the varying power requirement due to speed, wind and gradient. He exhibited some graphs showing variation in carbon dioxide, carbon monoxide and oxygen in the exhaust gases. As he pointed out to an engineer in control of a stationary plant, such graphs would seem like a nightmare. The results of the series of experiments would no doubt be published when further progress had been made.

Safety in Testing Stills

Additions to Model Rules

THE Association of British Chemical Manufacturers has issued a series of additions to its model safety rules dealing with the testing of stills, drawn up by the Works Technical Committee of the Association in co-operation with the Home Office as the result of discussion following the Mitcham explosion in March, 1933. The additions are as follows:

Rule 1. Every still used for distilling inflammable liquid, that is to say any liquid flashing in the Abel apparatus below 80° F., shall be carefully examined and tested at least once a year by a competent person by a method or methods appropriate to the particular type of still. This person shall issue a certificate which shall be kept attached to the General Register. If any alteration or repair is carried out in connection with the still, the examination and test of the part or parts affected shall be repeated and a new certificate obtained. (Explanatory note.—Among the methods that may be used for testing are a hydraulic test with water or oil, an air test, a hammer test and drilling for thickness. In some cases a steam test has been found useful for detecting defects, but great care must be exercised in applying such a test so as not to set up dangerous strains in the material of the still.)

Rule 2. Suitable precautions shall be taken to prevent the escape of inflammable liquid from any still through the fracture of any gauge glasses. (Explanatory note.—Gauge glasses fitted to stills used for inflammable liquids to indicate the level are liable to be fractured and are then a source of danger. Fracture may occur either through a blow on the glass or through a sudden change of temperature. The first risk can be minimised by enclosing the gauge glass in a suitable guard and the second by using a gauge of a specially resistant glass. The danger due to escape of liquid from the still arising from breakage of the gauge glass may be met in most cases by arranging for the bottom stopcocks to be kept closed by weighted levers, spring-controlled valves, or some other means, except when it is necessary to take a reading. It has been suggested that there may be risk of breakage of the glass when the hot liquid of the still is put into communication with the relatively colder liquid in the gauge, but this risk will be very small in the case of gauges made of a suitable glass. Even where there is a liability of the plug of a gauge cock sticking or gumming, the result of this will be less serious in the event of a glass breaking if the plug is in the closed position than if it were stuck in the open position.)

Rule 3. In those buildings or parts of factories where inflammable atmospheres are likely to be produced all electrical fittings shall be of the flameproof type and made to British Standard Specification. (Explanatory note.—The ordinary types of switches, fuses, motors and other electrical apparatus can often be installed outside such buildings in positions where there is no inflammable atmosphere.)

Rule 4. In factories where inflammable liquids are handled, valves or switches designed to cut off the supplies of steam, gas and electricity for the plant in which such liquids are used, shall be provided at an adequate distance from such plant. These shall be additional to those required at the plant for the actual control of the operations.

Another precaution that may often be usefully adopted is the provision of some means to prevent the spread of liquid should a leak occur, such as the construction of ramps or low walls, either round the plant or at doorways. Care should also be taken, when necessary, to isolate the plant from boiler fires or similar sources of ignition by means of suitable partitions.

Letter to the Editor

Engineers Trained in Chemistry

SIR,—Professor H. E. Armstrong's speech at the City and Guilds jubilee celebrations stirs many memories in one who had the pleasure and the honour of being one of his students when the Central was at its best. I can certainly endorse Professor Armstrong's claim that the Central in those days did provide a carefully thought-out training in chemistry, or, at any rate, the essence of chemical methods, for such engineer students as might want it, and they were very few. Opportunities were also available for chemist students on certain days in the week to go into the engineering shop or drawing office and the electrical laboratories if they wished to do so. Again, very few did.

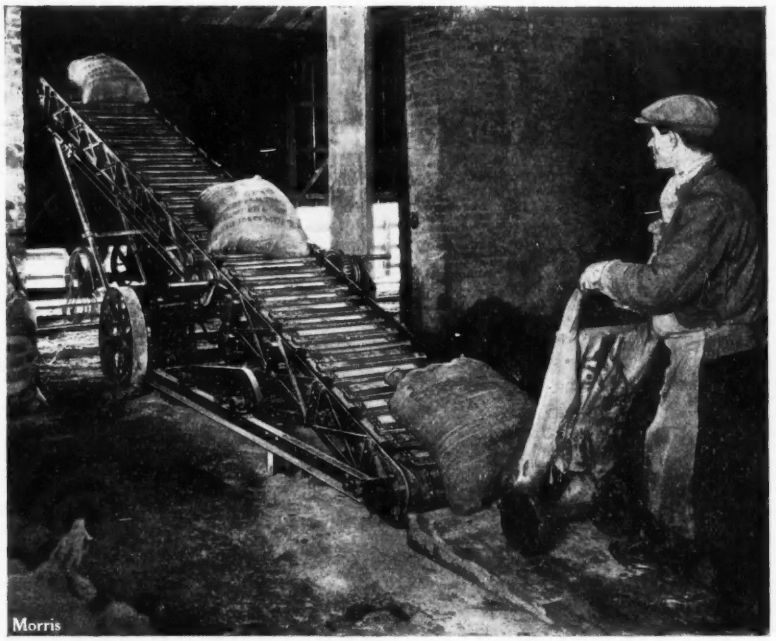
I was a freak, because, as well as having a determination dating from early childhood to become an engineer, I was intensely interested in chemistry and also electricity, and my original intention was to specialise in electro-chemical engineering. Before going to the Central I served two years in the shops, and I am still convinced that this is the right order, shops first and college afterwards. I then took the second and third year courses in the electrical engineering department, which courses included a great deal of time devoted to mechanical engineering and also a systematic course in inorganic chemistry, added to which every hour which was left optional found me in the chemical laboratory. I then took a third year on research work in applied chemistry under Professor Armstrong himself, one long piece of work being done in collaboration with (now Professor) T. M. Lowry.

I apologise for going into these personal details, but my point in doing so is to show that, through the lucky chance of choosing the Central for my training, I was able, after my two years in the shops, to obtain within three years, making five years in all, a wonderfully comprehensive training as a chemical engineer, considering that these years were the last five of last century. The credit for this being possible at that date is undoubtedly due to Professor Armstrong, and there is little doubt that no such facilities then existed anywhere else in the country.

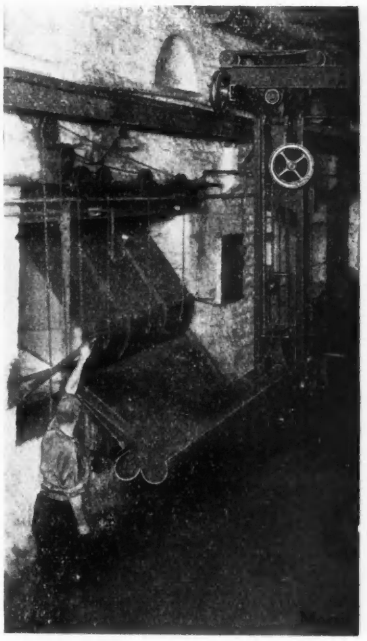
Few of the college authorities who draw up the courses realise, I think, as Professor Armstrong does, how utterly useless to an engineer the standard academic course in chemistry, and especially the advanced part of it, is; and vice versa the chemist student needs a special engineering course. Yet, every year that goes by increases the necessity for *every* engineer in whatever branch of the profession to have some knowledge of chemistry. As regards chemical engineers, there is room for both those who start as chemists and for those who start as engineers, but, unfortunately, the former at present outnumber the latter in a ratio of 10:1. There are branches of chemical engineering where the chemist man, particularly if he has specialised in physical chemistry, has a great advantage, but when it comes to the practical design of plant, involving a first-hand knowledge of shop methods and of the finer points of good and bad design, he is lost and the engineer man comes into his own.

May I, in conclusion, add my appeal to Professor Armstrong's for more and better facilities for engineers to learn chemistry, but chemistry put in a form that they can see will be useful to them and will therefore not shun like the plague. At the same time could not the Institution of Chemical Engineers do a little propaganda work to attract more engineer entrants to our profession?—Yours, etc.,

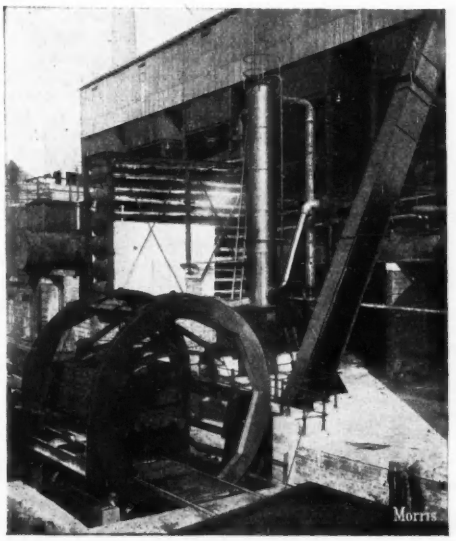
J. H. WEST, M.I.Chem.E., A.C.G.I.
8 Langbourne Mansions,
Highgate, N.6.



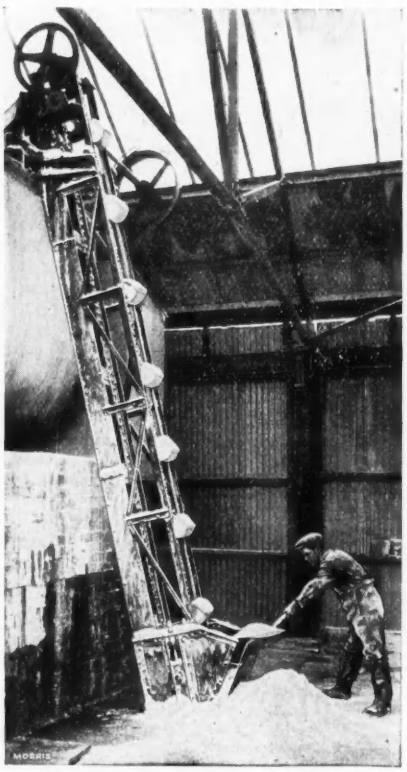
Above: This Morris Portable Conveyor is installed in a dockside warehouse. It is of the chain-lattice type.



Above: A Morris Retort Charger handling coal at a modern gas-works.

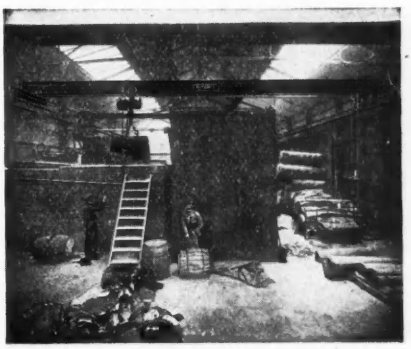


Above: A Morris Tippler working in conjunction with a Morris Elevator in handling coal.



Above: The task of elevating soda ash at a bleachery is solved by a Morris Bucket Elevator.

Modern Conveying and Elevating Plant



Below: This Morris Girder Crane is usefully employed in charging plant at a chemical works, the material being hoisted in the drums as received.

British Overseas Chemical Trade in January

Big Increase in Exports : Imports Decrease

THE Board of Trade returns for the month ended January 31 show that the month's exports of chemicals, drugs, dyes and colours were valued at £1,780,171, against £1,426,661 for January, 1934, an increase of £353,510. Imports for the same period were valued at £960,955, against £1,009,618, a decrease of £48,663, while re-exports amounted to £54,069 against £34,278, an increase of £19,791.

Imports

	Quantities. January 1934.	Quantities. January 1935.	Value. January 1934. £	Value. January 1935. £
Acids—				
Acetic .. .. cwt.	18,229	12,967	28,007	20,068
Boric (boracic) ,,	3,010	7,182	3,059	6,963
Citric .. .. ,,	700	1,999	2,103	6,578
Tartaric .. .. ,,	5,401	1,298	21,354	5,563
All other sorts value	—	—	12,086	9,178
Calcium carbide .. cwt.	108,681	88,787	59,113	50,958
Potassium compounds—				
Caustic and lyes cwt.	12,589	11,120	15,068	13,490
Chloride (muriate) ,,	60,679	49,453	25,252	15,566
Kainite and other mineral potassium fertiliser salts, not elsewhere specified cwt.	102,272	84,105	15,712	11,057
Nitrate (saltpetre) ,,	5,605	18,615	5,244	8,049
Sulphate .. .. ,,	15,074	36,374	6,997	12,753
All other compounds ,,	8,342	9,218	13,299	16,671
Sodium compounds—				
Carbonate, including soda crystals, soda ash and bicarbonate cwt.	21,873	14,592	6,620	3,525
Chromate and bichromate .. .. cwt.	4,683	6,433	6,497	8,502
Cyanide .. .. ,,	1,000	3,957	2,370	9,835
Nitrate .. .. ,,	1	159,762	11	37,888
All other compounds ,,	22,533	19,463	18,127	16,751
Other chemical manufactures .. .. value	—	—	260,789	210,871
Drugs, medicines, etc.—				
Quinine and quinine salts ozs.	69,092	70,326	4,963	5,981
Medicinal oils .. cwt.	1,723	3,160	3,953	7,181
Ointments and liniments cwt.	2	58	179	3,440
Proprietary medicines value	—	—	44,603	42,722
All other sorts .. ,,	—	—	39,623	52,650
Raw or simply prepared value	—	—	34,565	37,527
Finished dye-stuffs (coal tar) .. .. cwt.	4,508	2,968	122,621	88,269
Extracts for tanning—				
Chestnut .. .. ,,	36,223	32,723	25,840	22,727
Quebracho .. .. ,,	55,887	17,782	35,206	10,283
All other sorts .. .. ,,	38,577	29,481	29,402	18,755
All other dyes and dyestuffs .. .. cwt.	912	1,062	5,101	14,197
Painters' colours and materials—				
White lead, basic carbonate .. .. cwt.	7,210	6,290	8,489	7,126
Lithopone .. .. ,,	21,691	14,711	15,178	9,840
Ochres and earth colours cwt.	28,117	27,990	11,814	9,971
Bronze powders ,,	1,519	1,953	10,740	13,592
Carbon blacks .. ,,	53,227	41,645	55,199	61,631
Other pigments and extenders, dry .. cwt.	27,423	31,025	8,117	8,225
All other descriptions ,,	10,284	11,404	22,646	24,203
Total .. .. value	—	—	1,009,618	960,955

Exports

	Quantities. January 1934.	Quantities. January 1935.	Value. January 1934. £	Value. January 1935. £
Acids—				
Citric .. .. cwt.	1,395	3,312	4,797	11,550
All other sorts .. value	—	—	21,909	25,438
Aluminium compounds tons	1,397	1,618	8,070	16,720
Ammonium compounds—				
Sulphate .. tons	12,508	25,807	80,046	139,720
All other sorts .. ,,	538	2,062	9,779	23,467
Bleaching powder (chloride of lime) .. cwt.	51,288	55,136	13,956	14,363
Coal tar products—				
Tar oil, creosote oil gal.	2,544,348	4,400,674	37,791	91,746
All other sorts .. value	—	—	13,870	12,040
Copper, sulphate of tons	2,946	1,964	42,457	25,782
Disinfectants, insecticides, etc. .. .. cwt.	29,268	29,749	63,891	60,364
Glycerine .. .. ,,	16,628	19,797	34,679	45,372
Lead compounds .. ,,	10,441	10,209	13,206	12,446
Magnesium compounds tons	365	463	8,672	10,402
Potassium compounds cwt.	6,027	4,665	13,019	11,894
Salt (sodium chloride) tons	21,278	23,756	55,495	58,298
Sodium compounds—				
Carbonate, including soda crystals, soda ash and bicarbonate cwt.	280,002	462,768	77,960	117,258
Caustic .. .. ,,	171,823	211,416	97,103	111,663
All other sorts ,,	59,684	55,113	57,718	73,391
Zinc oxide .. tons	656	1,033	13,850	18,492
All other descriptions value	—	—	170,883	196,875
Drugs, medicines, etc.—				
Quinine and quinine salts oz.	99,916	210,183	11,356	21,636
Proprietary medicines value	—	—	105,649	114,840
All other descriptions value	—	—	134,740	135,909
Dyes and dye-stuffs—				
Finished dye-stuffs (coal tar)—				
Alizarine, alizarine red and indigo (synthetic) .. cwt.	591	1,192	4,850	5,865
Other sorts .. ,,	4,547	7,569	69,749	105,789
All other descriptions cwt.	16,239	37,242	24,590	36,399
Painters' colours and materials—				
Ochres and earth colours cwt.	11,333	12,905	12,895	15,888
Other descriptions ,,	12,517	16,310	17,058	29,328
Paints and painters' enamels, prepared cwt.	29,137	39,530	78,672	102,819
Varnish and lacquer (clear) .. gal.	77,181	83,233	30,103	32,596
All other descriptions cwt.	32,401	33,739	65,502	68,973
Total .. .. value	—	—	1,426,661	1,780,171

Re-Exports

	Quantities. January 1934.	Quantities. January 1935.	Value. January 1934. £	Value. January 1935. £
Chemical manufactures and products .. value	—	—	13,786	19,692
Drugs, medicines and medicinal preparations—				
Manufactured or prepared .. .. value	—	—	6,900	10,040
Raw or simply prepared value	—	—	8,946	22,431
Dyes and dyestuffs and extracts for dyeing and tanning .. .. cwt.	328	401	3,598	1,239
Painters' colours and materials .. .. cwt.	545	260	1,048	667
Total .. .. value	—	—	34,278	54,00

Continental Chemical Notes

Sweden

BRIQUETTED BEECH WOOD CHARCOAL is believed to have possibilities as an automobile fuel and its manufacture is to commence shortly by a firm in Tving.

Czecho-Slovakia

TRANSPARENT VISCOSE PAPER MANUFACTURE is contemplated by a German firm at Tyssa. At present the Visco concern of Ossig, with a production covering 50 per cent. of the home requirements, are the sole makers in the country.

Greenland

EXPORT TRADE IN CRYOLITE (sodium-aluminium fluoride) fell off considerably in 1933. The figures (compared with 1932) were 10,351 tons valued at 2.3 million kronen, as against 17,874 tons of the value of 3.5 million kronen.

Poland

A NEWLY-DISCOVERED OZOKERITE DEPOSIT in the Boryslan oil field is to be exploited in the near future.

THE FIRST TRADING YEAR of the concern formed by merging the Moscice and Chorzow Nitrogen Works has closed with a profit of 0.2 million zloty, but no dividend is being distributed. Among the products turned out during the year were (at Moscice): nitric acid, oxygen and ammonium nitrate; (at Chorzow): refined salammoniac, potassium nitrate and ammonium carbonate.

Germany

BUMPING DANGERS DURING DISTILLATION WORK in the laboratory are best avoided, according to a writer in the "Chemker-Zeitung," by adding a little finely granulated natural heavy spar. Owing to the high density (4.5) of the mineral, surface strains are eliminated while chemical reactivity is ruled out in all except the rarest cases.

MANGANESE CARBONATE is stated to be the catalyst now used in the large-scale oxidation of acetaldehyde to acetic acid. As described by Dr. H. Thommen in the "Chemiker-Zeitung" of February 13, the process now favoured, which is based upon the discovery that the oxidation proceeds rapidly if the acetaldehyde is diluted with an indifferent substance, is conducted in a 5,000 litre reaction vessel in which the aldehyde is diluted with acetic acid so that its concentration never exceeds 2 per cent.

GOOD PROPERTIES ARE ASCRIBED to artificial fibres based upon nitrocellulose in admixture with other synthetic fibre-forming derivative, thus suggesting a further outlet for nitrocellulose in the rayon industries. Among the materials giving promising results in association with nitrocellulose were benzyl cellulose, butyl cellulose, vinyl acetate, rubber and acrylic acid esters. Working on these lines it is hoped to dispense with the necessity for denitration owing to the relatively low inflammability of the mixtures ("Nitrocellulose," December, 1934).

Chemical Firm Fined

Drugs Offence Alleged at Glasgow

JAMES Taylor (Trongate), Ltd., Glasgow, manufacturing chemists and druggists, were fined £2 at Glasgow on February 12 for selling to a retail chemist on August 7 five pints of tincture of iodine, composed of quantities of iodine and potassium iodide in excess of the quantities stipulated by the British Pharmacopœia. It was stated by Mr. James Geddes Wright, the retail chemist, that he sold samples to the food and drug inspectors on October 8. He was summoned, but proved that he had a warranty from the wholesaler. He said the samples he sold were exactly as he had bought them from Taylor's.

The managing director of Taylor's, Ltd., said that when the tincture of iodine left them it was correct. The warranty held good only for a reasonable time, and he thought the time which elapsed between the supply of the iodine to Mr. Wright and the time of its sale to the inspectors was not reasonable. On hearing of the steps taken against Mr. Wright, he said, they recalled as much as possible of the iodine from the same make and had it analysed, and it was found to be correct.

Far Eastern Chemical Notes

China

A PAPER FACTORY with a daily capacity of 50 tons of newsprint is now under construction in the province of Kiangtung.

Japan

THE DISCOVERY OF RADIOACTIVE ORES with a 62 per cent. uranium content is reported in the Yamaguchi district.

SYNTHETIC CITRIC ACID MANUFACTURE is expected to commence in July at a new factory being built at Kawasaki by Ajinomoto Hompo Suzuki Shoten.

PHARMACEUTICAL PRODUCTS, including pheayldimethyl pyrazolone, amidopyrin and phenacetin, will be made at a new factory of the Nippon Seuryo Seizo K.K. (Japanese Dyestuff Co.) at Osaka-Torishma.

News from the Allied Industries

China Clay

THE NEW YEAR STARTED AUSPICIOUSLY for the china clay industry and producers generally have a stronger confidence in the recovery of trade. January shipments were: Fowey: 35,760 tons china clay; 2,367 tons china stone; 1,968 tons ball clay. Par: 10,101 tons china clay; 231 tons china stone. Charlestown: 4,926 tons china clay; 756 tons china stone. Padstow: 1,001 tons china clay. Penzance: 859 tons china clay. Newham: 216 tons china clay. Plymouth: 94 tons china clay. By rail throughout: 5,003 tons china clay. These figures reveal a total tonnage of 63,282 tons, compared with 60,465 tons in January, 1934.

Tanning

THE DEMAND FOR SOLE LEATHER has been maintained and supplies of the cheaper grades are low. The export figures of the first eleven months of 1934 showed a slight increase over those of 1933. The craze for cheap sole leather has revived the use of fillers such as size, epsom salts and glucose. The chrome leather industry is very busy with spring and summer orders. Black and brown suede leathers are very popular. White cellulose finished leather promises to be popular again this summer. Bleached lining leathers are being freely purchased for export to America. A British firm has discovered a new process of patent leather manufacture in which nitrocellulose is used and the process rights have been granted to a Midland leather dresser for five years.

Salt Workers Ballot

Strike Vote Recorded

THE ballot of salt workers in Cheshire, Worcestershire and South Durham shows a large majority in favour of strike action to enforce the restoration of 1931 pay cuts. The result of the ballot, conducted by the Federation of Trade Unions of Salt Workers was announced on February 16 and showed: In favour of strike 1,060, against 181 (165 being neutral).

Only employees of firms in the Salt Manufacturers' Association were represented in the ballot. This represents approximately 70 per cent. of the trade, the remaining 30 per cent. being composed of small firms whose employees are to meet at an early date to decide their course of action. Mr. T. Bratt, secretary of the Salt Workers' Federation, said he did not think a strike would be necessary. The demand would again be placed before the manufacturers, together with the overwhelming figures, and he thought they would grant the demand.

Mr. T. G. Barton, a director of the Salt Union, Ltd., a firm which employs more than 50 per cent. of the workers balloted, said that a strike would mean ruin. They would immediately lose all their foreign trade, with the consequent probability that they would never get it back. In a few days many chemical works would be at a standstill, with consequent serious losses in home and foreign markets. So numerous were the ramifications of the salt trade and the number of industries partly or wholly dependent on salt that the effect of a stoppage would undoubtedly be disastrous.

Personal Notes

MR. GEORGE E. GARLICK, of Burbage, Buxton, formerly architect and surveyor to Buxton Lime Firms, has died at the age of seventy-one.

SIR JOSIAH STAMP, at the first investiture of the year, on February 19, at Buckingham Palace, formally became Knight Grand Cross of the Order of the Bath.

SIR HORACE LAMB, of Cambridge, the noted mathematician and physicist, for many years Professor of Mathematics at Manchester University, and afterwards Hon. Fellow of Trinity College, Cambridge, who died on December 4th last, left estate of the gross value of £27,617, with net personalty £25,506.

LORD LEVERHULME was unanimously re-elected president at the annual meeting of the United Comrades' Federation of Lever Bros. (the Port Sunlight branch of the British Legion) at Port Sunlight on February 15. The organisation, which is the strongest in the north-west province, was reported to be in a healthy financial position.

SIR JAMES ALFRED EWING, the distinguished scientist engineer and expert on magnetism, who died on January 7, and who was president of the British Association in 1932, left £36,816, with net personalty £36,694. He gave £500 to the British Association for the advancement of science, and £500 to King's College, Cambridge "for the purposes of the Chapel in token of my affection for the college, my enjoyment of its fellowship, and my happiness in sharing its worship."

MR. ARNOLD PHILIP, the late Admiralty Chemist, died on February 16 at Upper Norwood, aged 74.

MR. HOWARD SPENCE, chairman of Peter Spence and Sons, Ltd., who died on August 24 last, has left £99,353.

MR. R. J. VARCOE, the managing director of the Goonvean China Clay and Stone Co., Ltd., is rapidly regaining health after a serious operation at Truro.

MR. W. E. GOODAY, who, until a few months ago, was manager of the technical department of the Vacuum Oil Co., has established himself as a consultant on lubricants and lubrication at Brettenham House, London, W.C.2. Mr. Gooday estimates that over £500,000 a year can be saved by British industry through the adoption of technical methods. Since 1928, Mr. Gooday has been deputy-chairman of the Stream Line Filter Co., of which Dr. H. S. Hele-Shaw is chairman.

DAME HELEN ROSE DEWAR, of Harcourt House, Cavendish Square, W., widow of Sir James Dewar, F.R.S., who died on January 7, left estate of £107,938 gross (net personalty £106,508). After other bequests she left the residue of her property for the furtherance of scientific research in chemistry and physics in connection with one of the universities at Edinburgh, St. Andrews, Glasgow, or Aberdeen, or for the benefit of any bacteriological institutes for the furtherance of original research in connection with the Royal Infirmary of Edinburgh and the Glasgow Royal Infirmary.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THERE are no price changes to report in the markets for general heavy chemicals, rubber chemicals, wood distillation products, perfumery chemicals, essential oils and intermediates. In the coal tar products section, medium soft pitch is quoted at 45s. per ton, against 48s. a week ago, and pyridine, 90/140, is from 6s. 6d. to 8s. 6d. per gal., against 6s. 9d. to 8s. 6d. Citric acid has shown a slight increase to 11¾d. per lb. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

LONDON.—Chemical markets maintain the steady conditions which have been noticeable for some time, there being a good average demand for most products with prices practically unchanged. There is no change to report from last week in the current prices for coal tar products and pitch.

MANCHESTER.—On the whole, the tendency on the chemical market in this district appears to be towards a gradual although by no means a substantial improvement in business. As has been the case during recent weeks, trading conditions are still somewhat patchy, but in several quarters during the past few days orders have been slightly more plentiful, with, however, buyers in the majority of instances not disposed to venture very far ahead. Whether this is due to any expectation of a movement of values in their favour is not clear. Here and there some easiness is in evidence, but the likelihood of any general reaction is extremely remote. Specifications for deliveries are on about the same scale as of late, with a slight tendency to expansion in certain directions. In some sections of the by-products market, also, conditions appear to be a little more active, without, however, any appreciable stirring in pitch. Rather more interest in tar for road purposes is being displayed.

SCOTLAND.—There has been a slight falling off in the inquiries for prices in the Scottish heavy chemical market.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80%, £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech. 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—Commercial granulated, £25 10s. per ton; crystal, £26 10s.; powdered, £27 10s.; extra finely powdered, £29 10s. packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—11¾d. per lb. less 5%. MANCHESTER: 11¾d.

ACID, CRESYLIC.—97/99%, 1s. 8d. to 1s. 9d. per gal.; 98/100%, 2s. to 2s. 2d.

ACID, FORMIC.—LONDON: £40 to £45 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works. full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, SCOTLAND: 80°, £23 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £55 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 0½d. to 1s. 0¾d. per lb.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE. SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £34 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden, 6¾d. to 1s. 2d. per lb.; crimson, 1s. 5d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £16 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r mines. SCOTLAND: White powdered. £23 ex wharf. MANCHESTER: White powdered Cornish, £21, ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—£11 per ton. SCOTLAND: £10 10s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station

in casks, special terms for contract. SCOTLAND: £8 in 5/6 cwt. casks for contracts over 1934/1935.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—2s. 4d. to 2s. 8d.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—3¾d. to 4⅞d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3¼d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—LONDON: £4 2s. 6d. per cwt. SCOTLAND: £4 2s. less 2½ per cent.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £25 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34; brown, £32.

LEAD NITRATE.—£27 10s. per ton.

LEAD, RED.—SCOTLAND: £24 to £26 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £36 10s.

LITHOPONE.—30%, £17 to £17 10s. per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

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PHENOL.—7¾d. to 8¼d. per lb. for delivery up to June 30.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £38.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5% d/d U.K. Discount according to quantity. Ground, 5½d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NIRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: B.P., 10½d.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 8¼d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8½d. ex store. MANCHESTER: Yellow, 8½d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r in bags.

SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 10s. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£22 per ton. LONDON: £23.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lb. less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.

SODIUM BISULPHITE POWDER.—60/62%, £18 10s. per ton d/d 1-cwt. iron drums for home trade.

SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£32 10s. per ton.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £15.

SODIUM META SILICATE.—£16 per ton, d/d U.K. in cwt. bags.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.

SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.

SULPHATE OF COPPER.—MANCHESTER: £14 per ton f.o.b.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 4s. 3d. to 4s. 5d. per lb.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.

ZINC SULPHIDE.—11d. to 1s. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 7¾d. to 8¼d. per lb.; crude, 60's, 1s. 1½d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 7¾d. per lb.; crude, 2s. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.

BENZOL.—At works, crude, 9d. to 9¼d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 5½d. SCOTLAND: Motor, 1s. 6¼d.

CREOSOTE.—B.S.I. Specification standard, 5¼d. to 5½d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 4¾d. to 5¼d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4½d.; heavy, 4¼d. to 4½d.

NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 7d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 2½d. to 1s. 3½d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Purified crystals, £10 per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PITCH.—Medium soft, 45s. per ton. LONDON: 45s. per ton, f.o.b. East Coast port.

PYRIDINE.—90/140, 6s. 6d. to 8s. 6d. per gal.; 90/180, 2s. 3d.

TOLUOL.—90%, 1s. 10d. to 1s. 11d. per gal.; pure, 2s. 2d. to 2s. 3d.

XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 1d. to 2s. 2d.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Feb., £7 3s. 6d. per ton; Mar./June, £7 5s.; for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station.

CYANAMIDE.—Feb., £7 2s. 6d. per ton; Mar., £7 3s. 9d.; Apr./June, £7 5s.; delivered in 4-ton lots to farmer's nearest station.

NITRATE OF SODA.—£7 12s. 6d. per ton for delivery to June, 1935, in 6-ton lots, carriage paid to farmer's nearest station for material basis 15.5% or 16% nitrogen.

NITRO-CHALK.—£7 5s. per ton to June, 1935, in 6-ton lots carriage paid for material basis 15.5% nitrogen.

CONCENTRATED COMPLETE FERTILISERS.—£10 5s. to £10 17s. 6d. per ton according to percentage of constituents, for delivery up to June, 1935, in 6-ton lots carriage paid.

NITROGEN PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton, for delivery up to June, 1935, in 6-ton lots carriage paid.

Latest Oil Prices

LONDON, Feb. 20.—LINSEED OIL was easier. Spot, £22 15s. (small quantities 30s. extra); March, £21 7s. 6d.; April, £21 10s.; May-Aug., £22 (yesterday £22 7s. 6d.); Sept.-Dec., £22 7s. 6d. naked. SOYA BEAN OIL was firmer. Oriental (bulk), Feb.-March shipment, £25 per ton. RAPE OIL was quiet. Crude extracted, £32; technical refined, £33 10s., naked, ex wharf. COTTON OIL was firmer; Egyptian crude, £27 10s.; refined common edible, £32; deodorised, £33 10s., naked, ex mill small lots 30s. extra). TURPENTINE was steady; American, spot, 48s. per cwt.

HULL.—LINSEED OIL, spot, quoted £22 2s. 6d. per ton; Feb., £21 12s. 6d.; March-April, £21 15s.; May-Aug., £22 2s. 6d.; Sept.-Dec., £22 10s. COTTON OIL, Egyptian, crude, spot, £27 15s.; edible, refined, spot, £30; technical, spot, £30; deodorised, £32 10s., naked. PALM KERNEL OIL, crude, f.m.q., spot, £20 10s., naked. GROUNDNUT OIL, extracted, spot, £23 10s.; deodorised, £26 10s. RAPE OIL, extracted, spot, £31; refined, £32 10s. SOYA OIL, extracted, spot, £26 10s.; deodorised, £29 10s. per ton. CASTOR OIL, pharmaceutical, 41s. 6d. per cwt.; firsts, 36s. 6d.; seconds, 33s. 6d. COD OIL, f.o.r or f.a.s., 25s. per cwt. in barrels. TURPENTINE, American, spot, 50s. per cwt.

Inventions in the Chemical Industry

Patent Specifications and Applications

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Complete Specifications open to Public Inspection

ABSORPTION OF NITROGEN OXIDES.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Aug. 11, 1933. 20378/34.

ALKALI PERBORATES and the like, production.—Naamlooze Vennootschap Industrielle Maatschappij Voorheen Noury and Van der Lande. Aug. 9, 1933. 21392/34.

AZO DYESTUFFS insoluble in water, manufacture.—Compagnie Nationale de Matières Colorantes et Manufactures de Produits Chimiques du Nord Réunis Etablissements Kuhlmann. Aug. 10, 1933. 22723/34.

COLOURED PHOTOGRAPHIC PICTURES, production.—I. G. Farbenindustrie. Aug. 8, 1933. 22950/34.

ALKALI METAL CYANIDES, manufacture.—E. I. du Pont de Nemours and Co. Aug. 8, 1933. 22975/34.

VAT DYESTUFFS, manufacture.—I. G. Farbenindustrie. Aug. 9, 1933. 23051/34.

METALLIC POWDERS, manufacture.—E. Kramer. Aug. 9, 1933. 23073/34.

AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. Aug. 11, 1933. 23185/34.

DYESTUFF INTERMEDIATES, manufacture.—E. I. du Pont de Nemours and Co. Aug. 11, 1933. 23321/34.

DYESTUFFS OF THE FLUORINDENE SERIES, manufacture.—I. G. Farbenindustrie. Aug. 11, 1933. 23340/34.

Specifications Accepted with Dates of Application

DEOXIDATION OF STEEL.—Soc. D'Electro-Chimie, D'Electro-Metallurgie, et Des Acieries Electriques D'Ugine. May 13, 1932. 423,584.

UNSYMMETRICALLY SUBSTITUTED ALKYLENE DIAMINES, methods of manufacturing.—Goodyear Tire and Rubber Co. July 13, 1932. 423,735.

AZO DYESTUFFS insoluble in water, manufacture.—I. G. Farbenindustrie. June 25, 1932. 423,736.

DIAZOIMINO COMPOUNDS and their application in dyeing and printing. Imperial Chemical Industries, Ltd., and K. H. Saunders. June 27, 1933. 423,587.

POLYMERISABLE PRODUCTS, manufacture and application.—Imperial Chemical Industries, Ltd., and R. Hill. July 3, 1933. 423,790.

CYANINE DYESTUFFS, manufacture.—I. G. Farbenindustrie. July 13, 1932. 423,792.

MAGNESIUM SULPHATE, production.—H. O. Dering. July 25, 1933. 423,663.

CITRIC ACID, process for the manufacture.—Arenella, Soc. Italiana per L'Industria Dell'Acido Citrico ed Affini. July 29, 1932. 423,668.

SODIUM CARBONATE DECAHYDRATE, manufacture.—H. E. Cocksedge, and Imperial Chemical Industries, Ltd. July 31, 1933. 423,592.

PROCESSES FOR OBTAINING a mixture of alumina and an insoluble calcium salt and for obtaining alumina.—J. C. Seailles. July 30, 1932. 423,594.

NITROGENOUS CONDENSATION PRODUCTS, manufacture.—A. Carpmael (I. G. Farbenindustrie). Aug. 2, 1933. 423,864.

ALUMINIUM FLUORIDE, production.—British Aluminium Co., Ltd., A. C. Coates and G. B. Brook. Aug. 5, 1933. 423,601.

ALIPHATIC ANHYDRIDES, manufacture.—H. Dreyfus. Aug. 9, 1933. 423,865.

INTERMEDIATES FOR THIOINDIGO DYESTUFFS, manufacture.—E. I. du Pont de Nemours and Co. Aug. 10, 1032. 423,869.

ETHYL ALCOHOL FROM ETHYLENE, production.—G. F. Horsley and Imperial Chemical Industries, Ltd. Aug. 11, 1933. (Addition to 369,216.) 423,877.

ACENAPHTHYLENE, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Oct. 23, 1933. 423,885.

REGENERATING SPENT AMMONIACAL CUPROUS SOLUTIONS from gas-washing processes, method and apparatus.—Chemical Engineering Corporation. Jan. 12, 1933. 423,762.

PULVERULENT METAL ALLOYS, manufacture.—I. G. Farbenindustrie. Jan. 24, 1933. 423,823.

DEOXIDATION OF COPPER.—Soc. D'Electro-Chimie, D'Electro-Metallurgie, et Des Acieries Electriques D'Ugine. June 6, 1932. 423,697.

ISATIN-α-HALIDES halogenated in the nucleus, manufacture.—Soc. of Chemical Industry in Basle. April 8, 1933. 423,833.

CUPRAMMONIUM ARTIFICIAL SILK, process for making.—British Bemberg, Ltd. April 15, 1933. 423,642.

ACID SLAGS FOR DEOXIDISING STEEL.—Soc. D'Electro-Chimie, D'Electro-Metallurgie, et Des Acieries Electriques D'Ugine. May 13, 1932. 423,732.

DEOXIDATION OF STEEL.—Soc. D'Electro-Chimie, D'Electro-Metallurgie, et Des Acieries Electriques D'Ugine. May 13, 1932. 423,731.

CELLULOSE DERIVATIVE PLASTIC COMPOSITIONS.—British Celanese, Ltd. May 19, 1933. 423,644.

METALLIC CARBONYLS, production.—A. H. Stevens (Catalyst Research Corporation). July 21, 1934. 423,907.

Applications for Patents

(February 7 to 13 inclusive.)

SALTS OF EPHEDRINE, production.—Boot's Pure Drug Co., Ltd., H. A. Stevenson and F. L. Pyman. 4258.

ARTIFICIAL MATERIALS, manufacture.—British Celanese, Ltd., 4077.

SYNTHETIC RESINS, ETC., manufacture.—British Cyanides Co., Ltd., and A. Brookes. 4550,4551.

ALKALINE EARTH METALS, preparation.—Calloy, Ltd., and G. N. Kirsebom. 4259.

PHOSPHORIC ACID ESTERS FROM FLAVINES, manufacture.—A. Carpmael (I. G. Farbenindustrie). 4154.

DYESTUFF INTERMEDIATES, manufacturee.—A. Carpmael (I. G. Farbenindustrie). 4548.

THERAPEUTICALLY-ACTIVE DERIVATIVES of phthalic acid, manufacture.—Chemische Fabrik Grünau Landshoff and Meyer A.-G. (Germany, Feb. 9, '34.) 4147.

CELLULOSE ESTERS, manufacture.—Distillers Co., Ltd., H. A. Auden and H. P. Standinger. 4029.

UREA-ALDEHYDE MOULDING POWDERS, manufacture.—S. W. Doherty. 4327.

CONCENTRATED NITRIC ACID, production.—E. I. du Pont de Nemours and Co. (United States, Feb. 20, '34.) 4189.

ANTHRIMIDE CARBAZOLE DYESTUFFS, production.—E. I. du Pont de Nemours and Co. (United States, Feb. 12, '34.) 4490.

IRON FROM WATER AND SALT SOLUTIONS, removal.—H. D. Elkington (Kamig Oesterreichische Kaolin und Montanindustries A.-G.). 4688.

THERAPEUTICALLY-VALUABLE ANTIMONY COMPOUNDS, manufacture. L. S. E. Ellis. 4015.

POLYMERIC ARTIFICIAL MATERIALS, manufacture.—W. W. Groves. 4366, 4368.

SHEETS FROM POLYMERISATES, manufacture.—W. W. Groves. 4369.

ACID TRIPHENYLMETHANE DYESTUFFS, manufacture.—W. W. Groves (I. G. Farbenindustriee). 4115.

VAT DYESTUFFS, manufacture.—W. W. Groves (I. G. Farbenindustrie). 4118.

SULPHUR DYESTUFFS, manufacture.—W. W. Groves (I. G. Farbenindustrie). 4506.

ARTIFICIAL BODIES from cellulose esters, manufacture.—W. W. Groves (I. G. Farbenindustrie). 4507.

VISCOSE OF FIBRES, manufacture from.—W. W. Groves (I. G. Farbenindustrie). 4508.

OZONE, production.—H. Harrison and J. R. Quain. 4533.

AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, Feb. 9, '34.) 4153, 4256.

DYEING, process.—I. G. Farbenindustrie. (Germany, Feb. 10, '34.) 4367.

INDIGOID VIT DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, Feb. 10, '34.) 4396.

HYDROCHLORIC ACID, manufacture.—Imperial Chemical Industries, Ltd., and J. W. Crabtree. 4417.

DYEING PROCESS.—Imperial Chemical Industries, Ltd., and A. G. Cuthbert-Smith. 4693.

CARBON BLACK.—J. Y. Johnson (I. G. Farbenindustrie). 4123.

ORGANIC SULPHUR COMPOUNDS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 4124, 4125.

CARBAMIC ACID CHLORIDES, stabilisation.—J. Y. Johnson (I. G. Farbenindustrie). 4642.

DYESTUFFS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 4643.

RAW PHOSPHATES, treatment.—Kaiser-Wilhelm-Institut für Eisenforschungeingetragenen Verein. (Germany, Feb. 9, 34). 4345. (Germany, Aug. 15, '34.) 4346. (Germany, Nov. 1, '34.) 4347.

LIGHT SENSITIVE DIAZO LAYERS, ETC., production.—Kalle and Co. A.-G. 4650.

KAOLIN, decomposition.—Kamig Oesterreichische Kaolin-und Montan-Industrie A.-G. (Austria, March 27, '34.) 4162.

CELLULOSIC ORGANIC DERIVATIVE SHEETING.—Kodak, Ltd. (United States, Feb. 13, '34.) 4284.

CELLULOSE ESTER COMPOSITIONS, ETC.—H. P. Staudinger. 4030.

From Week to Week

SI AHMED HADJI, from Morocco, visited the stand of W. J. Bush and Co., Ltd., at the British Industries Fair, on February 19.

THE TREASURY HAS MADE AN ORDER under section 10 (5) of the Finance Act, 1926, exempting acid dipropyl malonic from key industry duty from February 26 till December 31.

THE DIRECTORS OF SOUTHALL BROS. AND BARCLAY, LTD., and Southalls of Ireland, Ltd., have reached an agreement on satisfactory terms with Sangers, Ltd., for the sale to that company of the drug sections of Southalls' undertakings.

THE 1934 ADDENDUM SHEET to the official directory of members has been issued by the British Chemical Plant Manufacturers' Association. It includes the names of four companies new to the Association, and a list of the plant that they manufacture.

BOOTS PURE DRUG CO., LTD., states that the new arrangements for the large-scale production of insulin from ox pancreas do not, as appeared from its previous announcement, actually make Britain independent of foreign supplies of insulin, but render this country less dependent than hitherto on the imported product.

BARNSLEY FIRE BRIGADE was called on February 16 to the Old Silkstone Chemical Works, where an escape of gas from a large holder became ignited. The works are well equipped for dealing promptly with outbreaks of fire, and the brigade merely had to stand by for a short time as a precaution while the staff made everything safe.

TWELVE MEN WERE HURT in an accident with chlorine gas at the Bricklayers' Arms Goods Station, Old Kent Road, London, on February 15. The men were unloading a cylinder containing liquid chlorine from a box-truck, when there was an explosion, followed by an escape of gas. Altogether 28 men were affected by the gas, and 12 were removed to Guy's Hospital. After treatment they were able to leave.

DAMAGE ESTIMATED AT £100,000 was caused by a fire at the Luncarty Bleachfields Works, near Perth, belonging to Bleachers' Association, Ltd. The outbreak began in the turbine-room and spread rapidly. The staff firemen were unable to cope with the flames, but with the combined efforts of the Perth and Dundee brigades it was found possible to restrict the fire to the bleaching room, which is the main department of the works. More than 300 people will be temporarily thrown out of work.

THE IRISH FREE STATE imported chemicals, drugs, perfumery and similar products (including chemical fertilisers) to the value of £123,430 during December last, as compared with £101,138 in the corresponding month of 1933. The total value of imports of this class for the year ended December 31, 1934, was £1,306,327, against £1,369,159 in 1933. Exports of chemicals from the Free State during the year under review totalled £57,577, as compared with £46,127 in the previous year.

THE IMPORT DUTIES ADVISORY COMMITTEE has received applications for an increase in the import duty on ammonia (liquor and anhydrous), ammonium sulphate, ammonium sulphate nitrate, nitro-chalk, sodium nitrate of synthetic origin and ammonium phosphate, and any mixtures thereof and any mixtures containing one or more of these products. Representations should be addressed in writing to the Secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, Westminster, London, S.W.1, not later than March 7. The committee has decided not to make any recommendation in respect of applications for the addition to the free list of refined borax.

CANADIAN INDUSTRIES, LIMITED (in which I.C.I. is jointly interested with du Pont de Nemours), has announced the reorganisation of its chemical group. The change involves a regrouping of products. The acids and general chemicals division will in future be known as the general chemicals division. Under this division will come chlorine, caustic soda, acids, hydrogen peroxide (a new C.I.L. product which will be manufactured under special arrangement with B. Laporte, Ltd., of Luton, England), and other heavy chemicals. The former dyestuffs division is merged with the new organic chemicals division, which will also handle rubber and mining chemicals, Gardinol, rubber colours and a wide range of other items.

THE CAPTIONS TO THE ILLUSTRATIONS of chemical plant manufactured by Wm. Gardner and Sons (Gloucester), Ltd., in the article on "Screening and Sifting in Chemical Works," in THE CHEMICAL AGE last week (page 152) were not in their correct order. The illustrations marked "Nos. 2, 3 and 4" should have been described as follows: Fig. 2—Inclined grading reel, the barrel being covered with various meshes to give the grade required, and specially hoppered, for filling into the various sacks or receptacles. Fig. 3—Special reciprocating sieve fitted with patent ball cleaning device, the whole enclosed in frame to prevent the escape of dust. Fig. 4—Reciprocating sieve separator fitted with an automatic feeder for regulating the supply to the sieve. There was also an erroneous transposition of the captions to Figs. 2 and 3 in the illustrations of plant sold by L. A. Mitchell, Ltd., in the article on "The Important Question of Drying" in page 155.

CHANCE BROS., LTD., have received an order from the United Kingdom Optical Co., for five tons of optical glass to be used in bi-focals for use both at home and abroad.

THE NOMINAL CAPITAL of Redfearn Brothers, Ltd., glass-blowers, Barnsley, has been increased by the addition of £75,000, beyond the registered capital of £75,000.

A FALL OF FIFTY TONS OF ROCK occurred on February 13 in a barytes mine near Habberley. Several of the workmen had narrow escapes, but William Edwards, Pulverbatch, near Shrewsbury, was cut off.

THE IRISH FREE STATE GOVERNMENT has announced that it will continue to pay a bounty on Irish-made basic slag and cadmium preparations exported from that country for a further six months from April 1.

THE COURT OF APPEAL on February 18 made two orders for £700 security of costs in respect of appeals by New Zealand Sulphur Co. from judgments against the company. The applications were made in respect of the actions D. Kerman versus the company, and Goodenday versus the company.

OIL IMPORT QUOTAS have now been allotted by the Manchukuo State Oil Monopoly, and they are expected to put an end to foreign fears that their oil would be excluded. The Dutch, American and Russian quotas amount to 59 per cent. of the total, while that of Japan amounts to only 14 per cent.

A FATAL ACCIDENT occurred on February 14 in the Shawfield chemical works of J. J. White, Rutherglen. Francis O'Reilly, when fixing a belt on to a shaft, was caught by a mask he wore and dragged towards the machine. He was held there until the mask gave way, and when picked up was dead.

THE FOURTH INTERNATIONAL CONGRESS of Chemical and Technical Agricultural Industries will be held in Brussels from July 15-18, under the patronage of the King of the Belgians. The first Congress was held in 1894, and sections will be devoted to diseases of industrial plants, the growing of tropical plants for industrial purposes, and hop-distilling, cider-making, and vinegar-making.

PAIGNTON URBAN DISTRICT COUNCIL invites tenders for the supply during the year commencing April 1 next of Portland cement, castings, steel sections, hot and cold road surfacing compounds, etc. Details are available from the engineer and surveyor, and tenders have to reach the clerk to the council, Mr. John Hartley, at the Town Hall, Paignton, not later than 10 a.m. on Monday, March 4.

MEMBERS OF THE BILLINGHAM DIRECTORATE of Imperial Chemical Industries (Fertiliser and Synthetic Products), Ltd., the staffs, and the workmen, made presentations on February 14, to Dr. R. E. Slade, a recent managing director of the factory, who has been transferred to the London office of the I.C.I. The directors presented Dr. Slade with a silver salver, the staffs a silver tea service, and the workmen two silver fruit dishes.

A DEMAND has arisen in India for the reduction in the import duty on sodium hydrosulphite, as its consumption has increased enormously during the last few years, owing to the cotton mills' largely extended use of the superior classes of dyestuffs. It is stated that if the duty on imports from the United Kingdom is entirely remitted and if that on the imports from other countries be reduced to 10 per cent. *ad valorem*, the Government of India would have to sacrifice a revenue of not more than Rs.2 lakhs, while the mill industry would gain very considerably.

A SEVERE CRITICISM of the coalowners for failing to encourage the use of powdered fuel was made by Mr. J. H. Mahler, in a paper he read to the South Wales Institute of Engineers, at Swansea, on February 19. Pulverised coal, he said, was perhaps the most powerful single weapon yet placed in the hand of the coal industry to combat past and future encroachments of oil, and yet in this country the coal industry, so far from making a united effort to develop the use of powdered coal, only too often seemed ready to pour cold water on its efforts. In spite of its important advantages the use of the fuel had been slow and spasmodic.

A CONFERENCE ON INDUSTRIAL PHYSICS, organised by the Institute of Physics, is to be held in Manchester from March 28 to 30. The subject of the conference is "Vacuum Devices in Research and Industry," and the president of the Conference is Professor W. L. Bragg. Membership is open to all interested, and an exhibition of instruments, apparatus and books cognate to the subject of the conference will be held in the laboratories of Manchester University. Subjects chosen for informal lectures and discussions are: "Modern Electrical Illuminating Devices," "Applications of Photoelectric Cells," "The Cathode-Ray Oscillograph in Research and Industry," "Recent Applications of Mercury Vapour Rectifiers and Thyratrons," "High-Tension Vacuum Tube Devices in Research and Industry," and "X-Rays in Industry." Visits to local works and research laboratories are being arranged, and a Conference dinner will be held in the College of Technology. Further particulars may be obtained from the Secretary of the Institute of Physics, 1 Lowther Gardens, London, S.W.7.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

British India.—The Director-General, India Store Department, Belvedere Road, Lambeth, London, S.E.1, invites tenders for 11,375 ft. feet, ¼-in. diameter tubing of Monel metal or similar alloy. Tenders due March 5, 1935. Forms of tender obtainable from the above at a fee (which will not be returned) of 5s.

Brazil.—H.M. Consul at Porto Alegre reports that the Rio Grande do Sul (State Railways) are calling for tenders, to be presented in Brazil by March 18, 1935, for the supply of tool steel in bars, ultra rapid tool steel in bars, cast steel for hammers, levers, etc., hexagonal hollow drill steel and locomotive spring steel bars. (Ref. G.Y. 14826.)

Company News

Alpha Cement, Ltd.—An ordinary dividend of 5 per cent. is announced for 1934, compared with 4 per cent. for 1933. Payment will be made on March 2.

John Oakey and Sons, Ltd.—The net profits for 1934 have risen from £40,816 to £48,670. The ordinary share dividend is raised from 12 per cent. to 12½ per cent., and £10,000 placed to reserve, against £5,000 in each of the two previous years.

Fairy Dyes, Ltd.—The report for the year ended November 30, 1934, shows profits £8,213; to this is added the amount brought forward of £1,410, making £9,623. A dividend of 7½ per cent. is to be paid on the ordinary shares (10 per cent.), leaving £813 to be carried forward.

Eastwoods Cement.—An interim dividend of 5 per cent. has been declared on the ordinary shares for the year to March 31, 1935. No interim distribution was made last year, but 7½ per cent. was paid for the year, compared with 3 per cent. for the previous year.

Bradford Dyers' Association, Ltd.—The accounts for the year 1934 show a profit of £211,486, to which is added £36,285 brought forward. From this is deducted interest on debenture stock, £58,150, and depreciation on buildings, plant and machinery, fixtures, etc., £162,668, leaving £26,953 to be carried forward. For 1933, the profit, after providing £171,990 for depreciation, and after crediting surplus provision for tax, was £59,890.

Books Received

Technical Aspects of Emulsions.—Being the papers read at a Symposium held in London, December 7, 1934, under the auspices of the British Section of the International Society of Leather Trades' Chemists. Foreword by Professor F. G. Donnan. London: A. Harvey. Pp. 150.

Hutchinson's Technical and Scientific Encyclopædia. Edited by C. F. Tweney and L. P. Shirshov. London: Hutchinson and Co. Vol. I. Pp. 672. 28s. 3 vols., 4 guineas.

Fundamentals of Dairy Science. By associates of Lore A. Rogers. New York: Reinhold Publishing Corporation. Pp. 616. $6.00.

The Nitrogen System of Compounds. By Edward Curtis Franklin. New York: Reinhold Publishing Corporation. Pp. 339. $7.50.

Herstellung und Eigenschaften der Kunstseide und Stapelfaser. By Dr. Arthur Zart. Leipzig: Akademische Verlagsgesellschaft. Pp. 116. RM 9.80.

An Introduction to the Modern Theory of Valency. By J. C. Speakman. London: Edward Arnold & Co. Pp. 157. 4s. 6d.

British Plastics Year Book, 1935. London: Plastics Press, Ltd. Pp. 718. 15s.

British Chemicals and their Manufacturers. 1935. London: Association of British Chemical Manufacturers.

Official Publications

Department of Scientific and Industrial Research. Report for the Year 1933-34. London: H.M. Stationery Office. Pp. 192. 3s.

Report of Test by the Director of Fuel Research on the Plant of the British Coal Distillation Co., Ltd., at Newbold, Leicestershire. London: H.M. Stationery Office. Pp. 30. 9d.

A Study of the Boundary Lubricating Value of Mineral Oils of Different Origin. Department of Scientific and Industrial Research. Lubrication Research, Technical Paper No. 2. London: H.M. Stationery Office. Pp. 32. 9d.

New Companies Registered

Fernard Pharmacies, Ltd., Leicester House, High Street, Blackwood, Mon.—Registered February 18. Nominal capital, £1,000. Chemists, druggists, drysalters, oil and colour men. Directors: Donald L. Fernard, Minnie Harris, Thos. E. James.

Brimsdown Chemical Works, Ltd., 27 Finsbury Square, London.—Registered February 16. Nominal capital £10,000. Manufacturers or merchants of activated carbon chemicals and manures; distillers, dye makers, metallurgists. Subscriber: Francis A. Ford, 48 Newbolt Avenue, Cheam, Surrey.

Prufose, Ltd., 1 Lower Regent Street, London.—Registered February 16. Nominal capital £1,005. To acquire and exploit chemical or technical processes, designs and discoveries of all kinds. Directors: Henry J. Greville, James Hambledon, Maryon Hieger, Mrs. Frances Hieger.

Viscose Crepe Yarns, Ltd.—Registered February 7. Nominal capital £100. Manufacturers of and dealers in silk, artificial silk, crepe and other yarns. A subscriber: Jas. Hardy, The Lawns, Eaton, Norwich.

Forthcoming Events

LONDON

Feb. 18 to **Mar. 1.**—British Industries Fair. Olympia and White City, London.

Feb. 25.—Royal Society of Arts. "Factory Accidents—Their Prevalence, Distribution and Causation." D. R. Wilson. 8 p.m. John Street, Adelphi, London.

Feb. 26.—Royal Society of Arts. "Empire Production of Tung Oil." L. A. Jordan. 4.30 p.m. John Street, Adelphi, London.

Feb. 26.—Institute of Industrial Administration. "Transport as Affecting Industry." A. J. Malacrida. 6.30 p.m. St. Ermins, St. James' Park, London.

Feb. 27.—Institution of the Rubber Industry (London Section). "The Coating and Impregnation of Fabrics and Textiles by Latex." Dr. H. P. Stevens and W. H. Stevens. Institution of Mechanical Engineers, Storey's Gate, London.

Feb. 27.—Institute of Fuel. "Boiler Practice in H.M. Office of Works, with Special Reference to the Use of Blended Coals." A. G. Pallot. 6 p.m. Burlington House, Piccadilly, London.

Feb. 28.—The Chemical Society. The Madame Curie Memorial Lecture by Dr. A. S. Russell. 8 p.m. Lecture Theatre of The Royal Institution, Albemarle Street, London.

Feb. 28.—East Ham Oil and Colour Students' Association. "Some Petroleum Derivatives of Interest to the Paint and Varnish Industry, with Special Reference to Naphthenic Acid." C. G. Gray. 7.30 p.m. East Ham Technical College, London.

Feb. 28.—Institute of Vitreous Enamellers. "Silicosis." E. L. Middleton, W. R. Jones. 8 p.m. British Industries House, Marble Arch, London.

Feb. 28.—Institution of Petroleum Technologists (Students Section). Visit to the Gas Light and Coke Co., Beckton Works. Annual Dinner.

Mar. 1.—Institute of Chemistry. Annual general meeting. 30 Russell Square, London.

ABERDEEN

Mar. 1.—Institute of Chemistry (Aberdeen Section). "The Use of Polarimetric Methods in Determining Constitutions and Reaction Mechanisms." Robert Roger. 5.15 p.m. Marischal College, Aberdeen.

BIRMINGHAM

Feb. 25.—Institute of Vitreous Enamellers. "Cast Iron for Vitreous Enamelling." J. W. Gardom. 7.30 p.m. Chamber of Commerce, New Street, Birmingham.

Feb. 26.—Society of Chemical Industry (Birmingham and Midland Section). Joint meeting with the Institution of the Rubber Industry. "Plastics Based on Rubber." W. H. Stevens. 7.30 p.m. James Watt Memorial Institute, Gt. Charles Street, Birmingham.

Feb. 28.—Midland Metallurgical Societies. "The Rarer Metals—Gold, Silver and Platinium." L. McP. Austin. 7 p.m. James Watt Memorial Institute, Great Charles Street, Birmingham.

Mar. 1.—University of Birmingham Chemical Society. Joint meeting with the Chemical Society. "Recent Progress in Sesquiterpene Chemistry." Professor J. L. Simonsen. 5 p.m. University, Birmingham.

GLASGOW.

Feb. 27.—Institution of the Rubber Industry (Scottish Section). "The Mechanisation of Sales and Accounts Records." E. H. Lovell. Elmbank Crescent, Glasgow.

Feb. 27.—Alchemists Club. "Dye Manufacture in Scotland." R. F. Thompson. 7.30 p.m. University, Glasgow.

Mar. 1.—Society of Chemical Industry (Glasgow Section). Annual general meeting. 6.30 p.m. Royal Technical College, Glasgow.

Mar. 1.—Andersonian Chemical Society. "Some Stereo-Chemical Problems." Professor A. McKenzie. 3 p.m. Royal Technical College, Glasgow.

LEICESTER

Feb. 27.—Institution of the Rubber Industry (Leicester Sub-Section). "Technical Sales." J. O. Randle. College of Technology, Leicester.

LIVERPOOL

Feb. 27.—Chemical Society. "Solid Reactions and Explosive Decomposition." Professor W. E. Garner. 7.30 p.m. University, Liverpool.

MANCHESTER.

Feb. 26.—Institute of Fuel. Discussion on "Steam Costing." 7 p.m. Engineers' Club, Albert Square, Manchester.

Mar. 1.—Institute of Chemistry (Manchester Section). "Chemical Constitution and Physiological Action. Dr. F. L. Pyman. 7 p.m. Engineers' Club, Albert Square, Manchester.